

# The AUTOMOBILE



Army automobiles and Belgian refugees on the main road into France not far from the scene of actual fighting

## On the Belgian Frontier

Military Cars and Trucks in Endless Lines—Private Traffic Abolished—Rigid Regulations—Ruined Roads

By W. F. Bradley

*Special Representative of THE AUTOMOBILE  
with the Allied Armies in France*

ON THE BELGIAN FRONTIER, Nov. 5—Over deserted highways we sped through Normandy, charmingly beautiful in its autumnal cloak. Automobiles are too useful to be allowed to expend their energies haphazard; they are too dangerous to be given full liberty.

The military authorities have sought to abolish all private automobile traffic, and as ours was a civilian mission we had first of all to be put through the double sieve of a military and civil interrogation. When the police inspector ushered us out of his private office the little he did not know about us was hardly worth knowing. But this was not sufficient to give us the freedom of the road. Two hours later we had to appear, hat in hand, before a military board of five officers who ques-



The author, W. F. Bradley, driving a Belgian officer near the firing line

tioned and cross questioned us as if anxious to worm out some of the hidden secrets of our lives. Then were we free to travel over some of the deserted highways of France.

### Train Service Off

Motors are not the only restricted means of locomotion. When the train service is needed by the army the public has to wait—or walk. Thus, in a certain quiet township a farmer begged a lift to his home 20 miles away. When we had been assured that there were no military posts on this portion of the road, he was taken aboard. He got out on the outskirts of the town, so as to avoid passing before the guards, for however honorable he might be, it was forbidden for him to ride in a car without a special military permit. In half an hour he had covered a dis-



At the left are shown some of the French and Belgian soldiers on the road near Furnes, Belgium, near the firing line

At the right is a German automobile wrecked by Belgians on the canal side near Dixmude

Below is shown one of the Red Cross motor ambulances after it was struck by a shell



peasants who had fled from their quiet farms and peaceful villages as the German hordes swept in.

There were few valid men among them, for the army had claimed them. They told pitiful tales of their houses razed before their eyes, their cattle driven away, members of their community driven off as hostages, of long marching, of nights spent in barns, or sleeping in their wagons by the roadside. French gendarmes had taken in hand these human derelicts and were passing them on from town to town to districts where they could find employment and the necessities of life.

#### Devious Routes Followed

By devious routes, so as to avoid the main roads which might have been congested with army convoys, we worked our way towards that northeast corner of France where British, French and Belgians were endeavoring to drive back the innumerable forces of Germany. A village street was filled with women wending their way to church; they were all in deep mourning and not a man among them. There were more villages, deserted by all but women and children; valleys and hillsides were as quiet as the grave. Of military preparations there was not a sign.

#### Into the War Zone

Suddenly, from a thicket by the roadside a soldier stepped forth, raising his rifle with a meaning that could not be mistaken. We had entered the area occupied by the French and Belgian armies. The pass was examined carefully, the photographs it bore being compared with our features before we were allowed to pass into the war area. At various intervals, which might be from .5 to 3 miles, the same operation was gone through. French soldiers gave way to Belgian guards, then to Frenchmen, then again to Belgians. We were in the level dyke country, cut up with canals along which clumsy barges were towed by men and sometimes by

tance which would have necessitated 6 or 7 hours steady tramping. At a railroad grade crossing we came upon the cause of the suppression of his ordinary means of travel: a troop train, drawn by two powerful American engines, and carrying English horses and men to be flung into the great battle line on the northeast frontier.

At nightfall shelter was sought in a second-rate hotel of a small French town. The law forbade us as civilians to travel after sundown. The occupants of three military cars dined, lit their lamps and went forth into the darkness while we climbed a narrow staircase to an old-fashioned bedroom.

#### War's Miseries

Poets sing of the glory of war; travelers along the high-roads see little but its misery. Climbing a hill into a big village square we came upon hundreds of refugees and scores of long, lumbering farm wagons filled with household goods, old men and women and children. They were Belgian



mere girls. The roads were crowded with Belgian soldiers—the remnants of a gallant army which had been sent to the rear to reform for more desperate resistance.

#### The Three Armies

We had plenty of opportunities of judging the temper of the three nations united in their stand against the forces of the Fatherland. The English were authoritative, their officers haughty; the French were suspicious, their officers studiously correct; the Belgians were kindly, their officers hearty.

At one of the posts Belgian soldiers barred our path. The sergeant in command frankly stated that he was not satisfied as to our right to be in the military area; but he put his objections in such a gentlemanly manner, he was so courteous, that it was a pleasure rather than otherwise to be questioned by him.

#### 10 Days in the Trenches

A few miles further on, at a turn of the road where our direction seemed doubtful, we came upon a group of four Belgian soldiers and two gendarmes. Two of the men being sick, we offered them a seat in the car, and at the same time took over the rifles and kit of the others, promising to deposit all at the next village. After 10 days in the trenches, without being able to lie down to sleep, never a wash, with food passed on to them at night, our two passengers looked more like scarecrows than soldiers. They were both volunteers, mere youths, whose homes had been wrecked, whose parents had been scattered, and who were fighting with the

desperation of men who had nothing more to lose and everything to gain.

#### War's Steel Bands

Travelers, whether on foot, drawn by horses or propelled by gasoline, could not get into the important frontier town of A—until they had been individually examined. To get out again was even more difficult and probably we should have been there still had it not been for the kindly intervention of the Belgian authorities who gave all necessary passes to travel through the small portion of their territory still withheld from the enemy.

#### The Ruined Road

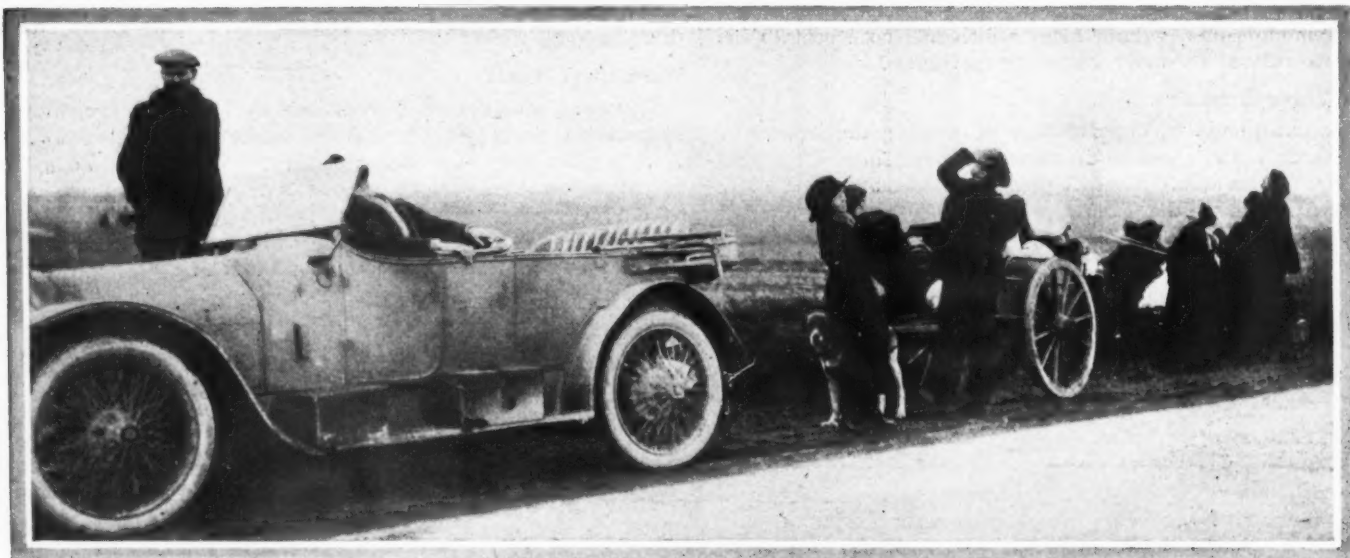
It was a Sunday afternoon. On the immediate outskirts of the fortified town well dressed burghers were making a pious pilgrimage to the cemetery and were depositing wreaths in memory of many who lay in unknown graves. To the



Above is illustrated a Belgian signalling car and German bicycles abandoned in the battle of the Yser. At the left a scene on the road outside Furnes. The Belgians have a little lamb.



Left—A Belgian armored car on the battlefield near Ypres, Belgium. Right—A Belgian armored car in the battle of Yser.



Belgian refugees on the road from Furnes to Dunkirk, watching a German aeroplane maneuvering above the frontier

northeast the steady boom of the cannon could be heard. On the main road running by the side of the canal there was such a variegated collection of human beings, of animals, of vehicles, of material, as only war can produce. It had once been a well-kept highway. But war material had rumbled along it, thousands of hoofs had loosened its surface, thousands of feet had trampled it into a bed of mud. Along the center the going was fairly good, but this passage was barely sufficient for two cars, and on each side were mud bands with holes from a few inches to a few feet deep.

#### Endless War Line

The procession of military automobiles was unending. As they passed one another they skidded and swerved in the mud baths, rocked ominously, but kept on their course. The war found Belgium without any great number of motor trucks, but with a good stock of touring cars. These machines have been taken and put to the most widely different tasks. Handsome limousines built by Van den Plas and D'Ieteren carried staff officers; equally handsome cars were filled with raw meat, packed to the roof with bread loaves, carried fodder for the horses, saddles, ammunition, oil and gasoline—everything which can be useful in war.



A wayside meeting—French and Belgian soldiers chatting with the representative of THE AUTOMOBILE

Take the automobiles on Fifth avenue, New York, when traffic is most intense, leave a few of the best cars untouched, set a band of ruffians to work on the others, bespattering them with mud, breaking the lamps, smashing the mudguards, tearing the hoods, delving the panels, smearing the upholstery, and you will have some idea of the state of the cars used in the Belgian army.

Such a condition of affairs is only a natural consequence when one considers the fact that these cars and trucks are most often driven by men who are not only unfamiliar with the construction and operation of the vehicles they are called upon to handle but many of whom are volunteers absolutely without experience in work of this character. It is greatly to be regretted that such is the case as there are plenty of men shouldering rifles, digging trenches, etc., who have had ample experience which is now absolutely wasted. The British army has attacked the problem in a more systematic way with the result that its motor transportation is much more efficient and much less wastefully administered than is the case in the other armies.

#### American Cars Used

Evidently the Belgian supply of cars has not been sufficient for the army's needs, for dozens of Overlands were noted in the convoys, occasionally a Maxwell was seen and staff officers occupied a Packard. It is obvious that touring cars are not the best vehicles for the various services to which they were put, but it was remarkable to note with what success the cars built for passenger carrying work were doing duties as varied as carrying King Albert and transporting barbed wire to the front.

England, France and Germany have special types of cars for special kinds of work, each machine being the result of careful thought and study. Belgium, plunged into a defensive war with no warning and little preparation, has had to rely on her touring cars—and has reason to be proud of them. King Albert's army has lost most of its cavalry, it has few transport horses, but it is feeding



itself and moving itself in a wonderful manner by means of touring cars.

#### Belgian Armored Cars

There is another use to which the Belgians have put their more powerful touring car chassis. Minervas, Savas, Excelsiors and Pipes, in particular, have been fitted with a machine gun and armor plating, and have done excellent service in the recent operations. There is nothing at all special about the chassis, and even the armor plating is not a difficult matter. Steel plates of not less than 5 millimeters thickness are built around the chassis, forming a single compartment in the center of which the gun is pivoted. In some cases a revolving turret is fitted, while others merely have a shield in front of the gun, and of course revolving with it. The driver occupies the most central position in the machine and is practically immune from attack except on the complete destruction of the vehicle. He has a view straight ahead through a hinged shutter and in addition has a small port on the right, level with his head.

#### In Bombarded Town

Germans were bombarding the town of Furnes when we ran onto the beautiful and historic marketplace. It was a curious situation; the weather was ideal; the big square was filled with armored cars, touring cars, and light trucks; French and Belgian soldiers marched through from time to time; officers came and went in cars; American and English newspapermen, driven out by the French and English, found shelter in the Belgian town and marched up and down with camera in hand; refugees with their scanty belongings on bicycles, on wheelbarrows, on frail carts drawn by a dog or a donkey, hastened westward; idlers stood at the street corners—and suddenly a shell burst over the town, coming from nobody knew where.

#### King Under Fire

The aim was indifferent for a couple of hours; then the Germans seemed to get the range, for a shell fell on the



A scene on the historic market place at Furnes while the Belgians were in possession

roof of one of the houses, within 20 yards of where King Albert was standing.

At the top of the tower, built in 1628, and which was being used by the Germans as a target, observers finally got the location of the battery. A force was sent out and within a couple of hours the guns had been silenced and sixty German prisoners were being marched across the square escorted by Algerian cavalry. The guns had been hidden in a farm when the enemy was forced to retreat and a small force had moved forward to operate them until ammunition was exhausted. The soldiers were captured and the civilians who had allowed the farm to be used were shot.

#### The Retreat

As evening closed in we ran back to French territory over a road blocked with every kind of traffic. Belgian artillery was being sent to the rear, and hundreds of refugees were taking advantage of the gun carriages to set their various bundles on them and walk by their side. Every class of society was represented, from the peasant in rough sabots carrying some clothing tied in a dirty bed sheet, to the comfortable bourgeoisie in furs and jewelry. There was no



Moving forward—Belgian automobilists and cyclists on the main road to Ypres in the forward movement of the Allied armies



President Poincaré and the King of Belgium reviewing the Franco-Belgian Army

whining or complaining. A man with a big black trunk on a wheelbarrow, his wife bending under a heavy bundle, and each of his four children carrying some domestic article, stopped to relate to a group of soldiers how he had decided to move when a shot had gone right through his house.

#### Injured Cars and Trucks

French long range artillery moved forward at a brisk trot, accompanied by their ammunition wagons surmounted by jet-black African soldiers who looked cleaner than most of the Europeans and certainly displayed more boyish glee. A wrecked German touring car lay directly across the bank with its radiator but a couple of feet from the canal. It had attempted the previous evening to get through to French territory. One of the new French four-wheel-drive tractors had taken fire and was being stripped by the mechanics of all the parts which might serve for companion machines. Cattle were being driven rearwards by Belgian soldiers who advised the motorists to "charge right in at them." In the country left and right of the road barbed wire obstructions had been erected, there were deep trenches behind, then further to the rear more trenches completely covered over.

Sleeping is always a delicate problem at the front. After some difficulty we discovered an attic with two beds in it, a window about a foot square and a roof so low that we could hardly stand upright. The furniture consisted of a broken chair and a dirty comb. As we examined it dubiously the landlady remarked, "Can't you be satisfied with one of the beds?"

#### All Cars Confiscated

During the night an order was posted in that town that all automobiles, of whatever kind, and without a single exception, must be presented to the gendarmes within 24 hours, under pain of confiscation. We decided to flee from that town. But there was no gasoline to be obtained. Without any warning the military authorities had confiscated the entire stock. After a thorough search we were able to pick up a gallon which a garage proprietor declared he had found in a touring car and to discover a gallon of benzol at a grocery store.

Just after crossing the frontier station into Belgium there was an imperative shriek from a Klaxon and a dozen handsome cars came round a bend of the road at a fast clip, driving all other users into the muddy side tracks. The cars carried King Albert of Belgium, President Poincaré, the French and Belgian ministers of war, Lord Kitchener and staff officers of the various armies. Shells had ceased falling at Furnes but were coming down 5 miles to the east. Even

this was sufficient to bring many of the peasants back again to their fields and their houses.

#### Deserted Caterpillar

It was reported that the road was cut up by shells, so we left the car in the village apple market and moved ahead on foot, following the coast road, the possession of which was still disputed. Wreckage was plentiful. By the side of a cobble paved road lay a German motor truck which had been used for bringing infantry forward. In one of the partly flooded fields was a German caterpillar tractor used for hauling guns across country. It was of the same type as some of the machines used by the French farmers for plowing. The Belgians had opened their dykes and even the caterpillar had become embedded in the mud.

The hiss and clap of shells greeted us at frequent intervals, but such is modern war that there was nothing to indicate where they were coming from or what they were being fired at. When the branches of trees began to fall 30 yards away we thought it best to retire.

While we were doing so some of the famous French heavy artillery came up drawn by their four-wheel-drive gasoline tractors only introduced about a year ago. A couple of miles further back a score of Paris motor buses rumbled past, each one carrying forty men. Running past one of the French encampments near the Franco-Belgian frontier, we had an example of the extreme mobility made possible by the use of automobiles. A driver hailed us and proved to be a friend in the automobile business. Two days before he had been at the other end of the battle line, 200 miles away. Reinforcements were required at the North sea end and within an hour hundreds of cars and trucks had been sent out with officers, men, guns and ammunition.

#### The Rescue

The gasoline problem was becoming acute when luck intervened. A Belgian officer approached the group of which we formed a part and asked if any car was going back into French territory. We seized the opportunity, volunteering not only to carry him into France but to his final destination, about 50 miles away. With a military order the gasoline was forthcoming immediately, and in much less than 2 hours we had brought the captain a distance which it would have required 10 or 12 hours to cover by train.

*It takes little to disorganize a railroad, while it is practically impossible to disorganize an automobile service.*

That run gave us an opportunity to examine some of the London motorbuses in war paint. Daily newspapers long



Belgian cyclists resting on the roadside in their advance on the German lines



ago worked up the story of a Hendon bus going into action with its "Glad Eye," "Come over Here," and other advertisement signs. Unfortunately for the newspaper men, the stories were released before the buses had got across the Channel. When they did come over they were hardly recognizable, for every word of advertising matter had been removed, they had been painted in a dull gray, the windows had been replaced by boarding, and the only decoration was a bouquet of flowers hung up by some Tommy where the service number usually appeared.

### Automobile Corps for Canadian Guards

MONTREAL, QUE., Nov. 20—More than 1,000 automobiles are to be equipped by the Automobile Club of Canada to form a battalion in conjunction with the Home Guard. The club, taking into consideration the prominent part that automobiles have played in the war, yesterday proposed to J. N. Greenshields, chairman of the organization committee of the Home Guards, the formation of such a corps in the Province of Quebec. The committee, formed of H. W. Pillow, president of the club, Eugene Tarte, vice-president and A. McNamee, secretary, had an interview with Mr. Greenshields yesterday, and their proposition was enthusiastically received.

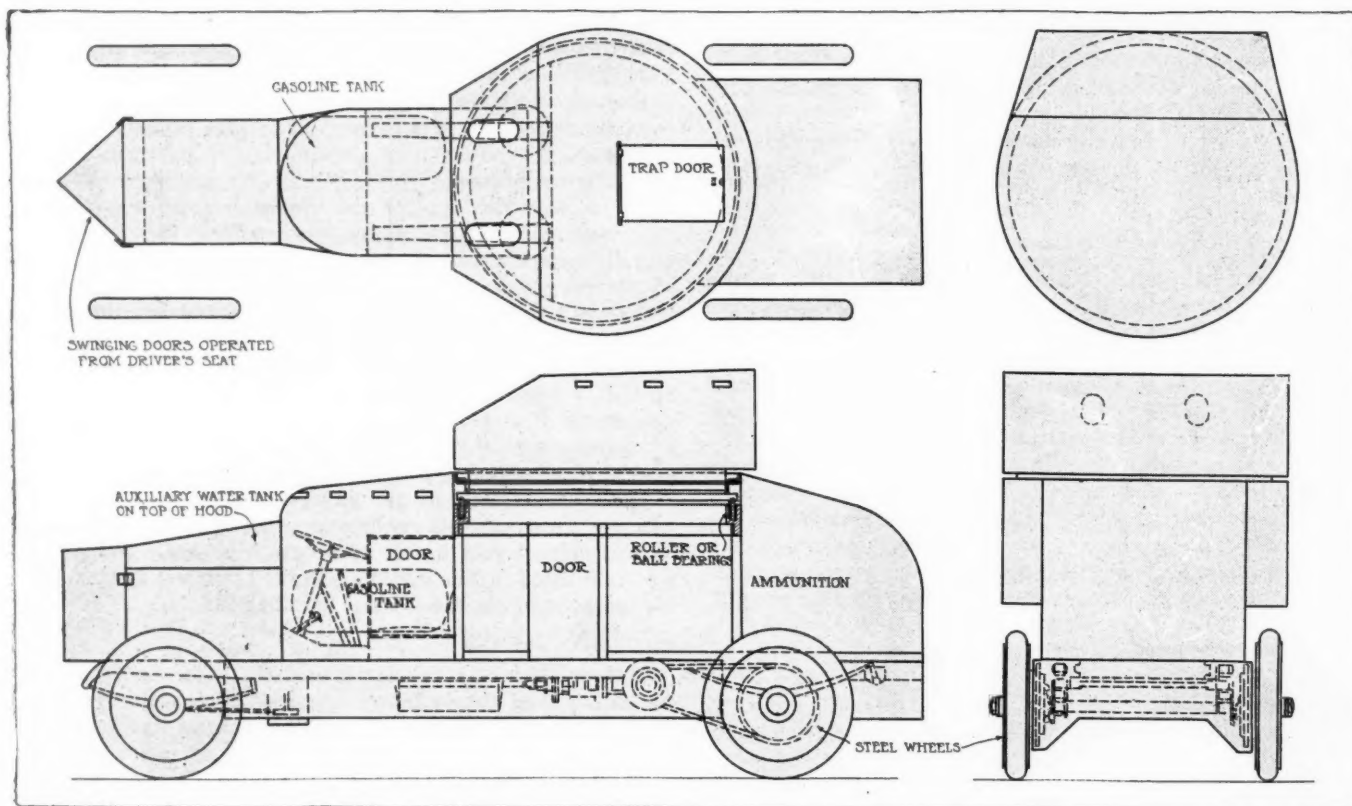
A number of automobile owners of this city have already offered the use of their cars, and have also promised to equip them with machine guns, ammunition, medical apparatus or other supplies.

### Ready for Border Raid

It is thought that with a thousand cars, the Home Guard could be transferred rapidly to any point at which the enemy might appear in force, especially should a raid be attempted from across the border. Plans have already been prepared for any contingency of this nature, although, naturally, they will not be made public. The directors of the club expect that their call will be met with a prompt answer from automobile owners in the city, and that by the end of the week the total number of cars registered will be over 1,000, ready for any emergency.

That aliens of enemy nationality who are to be interned as prisoners of war in Canada, should be put to work, breaking stones or doing other things necessary for building good roads was the suggestion made to General Hughes by an Ottawa delegation representing the Motor Assn. The suggestion was favorably received, but a definite answer was not given. The whole plan of what to do with such people is being reported on by General Otter.

## An Armored Truck with Revolving Gun-Turret



AS reported in THE AUTOMOBILE for November 19, the Armored Motor Car Corp. has been organized and incorporated in New York City for the purpose of producing an armored truck mounting two machine guns in a revolving turret. The illustration gives a side elevation, plan and rear views of the truck and a plan of the turret, showing the various constructional features.

J. H. Allen, organizer of the concern, has a patent pending covering the application of a revolving turret to a motor truck. The steel bodies will be built on contract and mounted on 2-ton Federal chassis. The two guns which are to be mounted will probably be Maxims firing 600 shots per minute.

Mr. Allen, in speaking of the field for such an armored truck, pointed out that under modern war conditions cavalry forces are practically useless for actual work on the battlefield or in reconnoitering under fire, as they are unable to withstand the terrible effects of high-power artillery and rifles. On the other hand, an armored car could not only pass practically unscathed through a withering rain of rifle bullets, etc., but could also do great execution with its machine guns. The revolving feature of the turret permits the fire of these guns to be directed against the enemy, irrespective of the direction in which the truck is traveling. The radiator is protected by swinging doors of armor plate.

# Eight Cylinders Analyzed by S.A.E.

Nine Reasons for Success Advanced in Paper by D. McCall White—Standards Committee Hears Division Reports

**N**EW YORK CITY, Nov. 24—At the meeting of the Metropolitan Section of the Society of Automobile Engineers held here tonight D. McCall White, of the Cadillac company read a paper on the high-speed, high-efficiency, eight-cylinder V-type engine. In it he divides cars into two classes, those used as a means of locomotion and those in which comfort and pleasure are as great in importance as infallibility.

Nine requirements of a successful design are advanced by the author; size, proportion, cooling, carburetion, lubrication, accessibility, simplicity, durability and manufacturing possibilities.

As regards size the eight is compared favorably with the four. The length is stated to be the same and the width but 2 inches greater. When these proportions hold true the power of the eight is 70 against 50 for the four. For the same power 50 per cent. more length is said to be needed for the six. The weight of the Cadillac eight is given as 50 pounds less than the previous four.

Better cooling efficiency is claimed because the distance of the rearmost cylinder from the radiator is less than in the six, thus giving the cooling advantages of the four. Each block of four cylinders is handled separately. As regards carburetion, one carburetor is claimed to give equal distribution when placed in the V, midway of the length of the cylinders.

## Force Feed for Bearing Surfaces

Force-feed lubrication is used for all bearing surfaces and the average life of the bearings is given as 30,000 miles. The same accessibility is offered as for the four, all ordinary fittings and adjustments being reached by simply raising the hood. The argument of simplicity which has been advanced against the eight Mr. White disposes of by stating that when roadability is taken into consideration the difference is not material; and, insofar as main bearings are concerned there are only the same number as in a four. Durability depends on vibration and the author claims that in eliminating the latter, long life has been secured. As for manufacturing costs, he admits that the six is less expensive but as an offset mentions the cheaper crankshafts, camshafts, etc., on the eight.

The remainder of the paper is devoted to a discussion of the practices adopted in the Cadillac eight.

## Paper Discussed

R. McA. Lloyd opened the discussion by stating that in his belief the Cadillac eight is a step in advance in American engineering practice. He pointed out that in this motor only 4 cubic inches per horsepower are used against 7 or 8 heretofore. But Mr. Lloyd doubted the necessity of such an amount of power.

Regarding gasoline economy, Mr. White stated that he had secured as high as 22 miles to the gallon with the eight and that it seemed to be better in this respect than the four.

A. F. Masury of the International Motor Co., who has had some experience in the manufacture of eights said that he believed difficulties might be found in the want of intelligent handling of the eight in the repair shop by men who were unfamiliar with the timing, etc. Henry M. Crane of the Crane Motor Car Co. expressed himself as not sure that the European trend of motor design is best.

In response to questions put by various members, Mr. White stated that the weight of the reciprocating parts was less than in a four of corresponding displacement, that the balance in practice worked out to the almost total elimination of vibration and the corresponding life of the motor was thereby increased.

The discussion was closed by David Beecroft who pointed out the broader meaning of the field of the eight. He stated that he did not feel that there should be a landslide towards the eight, but that it would be always with us to fill its particular niche in the industry, just as the four would fill its place.

## Fourteen Divisions Report at Standards Convention

**N**EW YORK CITY, Nov. 19—Materially advancing the standards work which will be reported to the meeting of the Society of Automobile Engineers at their winter session in January, the standards committee 3-day convention closed here today. During the meeting the reports of fourteen divisions were heard and seventy-six members of the committee registered at the S. A. E. headquarters. The meeting was open to all members of the society and the standards discussions were participated in by them as well as by the committee.

The topic which was of the utmost interest was that of the single wire vs. the double wire systems for use in connection with electric starting and lighting installations. It will be remembered that at the summer meeting at Cape May the society as a whole as well as the standards committee was deadlocked regarding the advisability of advancing the single wire installation with grounded return as recommended practice. This discussion was again taken up and the results of investigation made by the division showed that more than twice the number of cars that are fitted with the double wire system will have a grounded return. In view of the large majority of car makers which favored the single wire system it was felt by the committee that the best method of procedure would be to let events take their course. It was held that practice would reach the same end as standardization as regards the wiring installations.

## Headlights Discussed

Another subject, which in view of the wide discussion and legislation is of timely interest, is that of non-glaring headlights. The division dealing with this subject has appointed a sub-committee to investigate the opinions of various municipal and state authorities as to what constitutes glare. It was felt that in view of the chaotic difference of opinion which now prevails it would be far more wise to really determine what were the objectionable features of the so-called glaring headlights before attempting to adopt means of eliminating the rather vague quality of glare.

In the opinion of the division there are at present three successful methods of reducing glare. These three methods have been taken from the basic ideas of the various devices which have been presented to the society for testing purposes at the various section meetings and also those which have been widely advertised. Probably the most prominent of these methods is that in which the light is streamed so that the intensity of the rays is diminished either alto-



gether or in the line of direct vision. Again there is the method of reducing the amount of illumination by some such means as double bulbs, a resistance in the lighting circuit or series-parallel switches. The third method is that in which the light is deflected without affecting the total number of illuminating units.

#### Measuring Glare

It is the intention of this division to work towards a standard method of determining the quantity of glare. It has been reasoned that if it would be possible to standardize a method of measuring the amount of glare upon some standard form of lighting diagram, it would be possible to measure all lights according to this diagram and then ultimately to incorporate the legal amount of permissible glare in the laws dealing with this subject. This would give a definite standard to which lamp manufacturers could work and would also tend to form a desirable uniformity in lamp legislation.

Another suggestion of this division is in the nature of the nomenclature of lamp parts. To avoid the confusion which undoubtedly exists between the terms lamp and bulb the division proposes the following definitions:

**Bulb**—That part of the detachable electric light-giving unit comprised of a filament and its glass envelope and base.

**Lamp**—The fixture for mounting and utilizing the light of the bulb.

The work of reducing tire sizes was also continued at the meeting. The pleasure car wheel division submitted a report at the last summer meeting in Cape May in which the number of tire sizes was cut to eight regular sizes. It was suggested that the 36 x 5 size be added to the list and considerable discussion hinged upon this point. The matter was finally dropped and will be brought up again for discussion at the winter session. The stumbling block that the division has now discovered on this part of the work is whether or not the oversize tires should also be published in the list of standard tire sizes.

It was argued that the ordinary sizes are proper for all ordinary purposes and that the oversize is only required where some exceptional work is anticipated. Some of the members of the committee on this account took the stand that the makers would begin fitting these tires as regular equipment owing to the fact that they could procure them in quantities almost as cheaply as they could the smaller size and this would deprive the purchaser of his option of larger tires. The bad result of this is that it would force the user to use larger tires than he needed for ordinary work with the resulting poor efficiency in gasoline consumption and to waste power in driving the heavier wheels without gaining additional benefit.

#### Standardize Inflation

The pleasure car wheels division is going to have something to say in a short time on tire inflations. A standard table of inflations for tires of different sizes will be adopted and in this table will be given what the committee deems the desirable inflation for all-around work. While the table has been compiled it is still under consideration and will not be acted on at present. The tire sizes that the division is now working on are as follows:

SIZE	OVERSIZE	SIZE	OVERSIZE
30 x 3.....	31 x 3 1/2	34 x 4.....	35 x 4 1/2
30 x 3 1/2.....	31 x 4	34 x 4 1/2.....	35 x 5
32 x 3 1/2.....	33 x 4	36 x 4 1/2.....	37 x 5
32 x 4.....	33 x 4 1/2	38 x 5 1/2.....	39 x 6

In addition to these there is a 36 by 5 with the 37 by 5 1-2 oversize which has not yet been agreed upon.

Considerable attention was given to the tires for commercial vehicles. Owing to the fact that wheel trouble has been experienced by commercial car makers it has been found necessary to alter the dimensions of S. A. E. felloe bands. The discussion brought out that a number of makers felt that the trouble was due to the thin band which offered insufficient

support for the wooden felloe. An increase in the band of from .25 to .375 inch was considered desirable.

The discussion which followed this suggestion brought out that in the larger tires, for instance where 6-inch dual tires and over are used there is some question as to the advisability of increasing the thickness of the felloe bands as much as 1-2 inch. The amount of metal which it would be necessary to add in order to effect this change would so seriously increase the weight and the cost of manufacture that it would be almost as cheap to buy an entire metal wheel instead. The discussion hinged about the technicalities of wood wheel manufacture and brought out that there are often imperfections in the design and manufacture of these wheels. The point at which fault was found was in the bad connection between the spoke and felloe band. In order to make a proper connection at this point the spoke should be flared in order to cut down the amount of unsupported overhang.

The electric vehicle division is now operating in conjunction with the Electric Vehicle Assn. of America. The work upon which the joint committee is engaged has centered itself particularly along the line of proposed standards for electric motors of 60 and 80 volts. When the work is complete it is proposed not only to give the standard dimensions of these motors but also to issue charts showing the electrical characteristics of the motors.

The matter of electric vehicle speed and mileage ratings was also gone into by the electric vehicle division. Two standards were recommended in conjunction with these ratings. That on speed states that the rating shall be based on continuous operation with one-half load over hard even and level roads or pavements at the actual average of battery voltage. The rating covering mileage states that it shall be based on the rated 5-hour discharge capacity of the battery and the continuous run under the same conditions as those laid down for the speed test, that is, one-half load over hard roads at the actual average battery voltage.

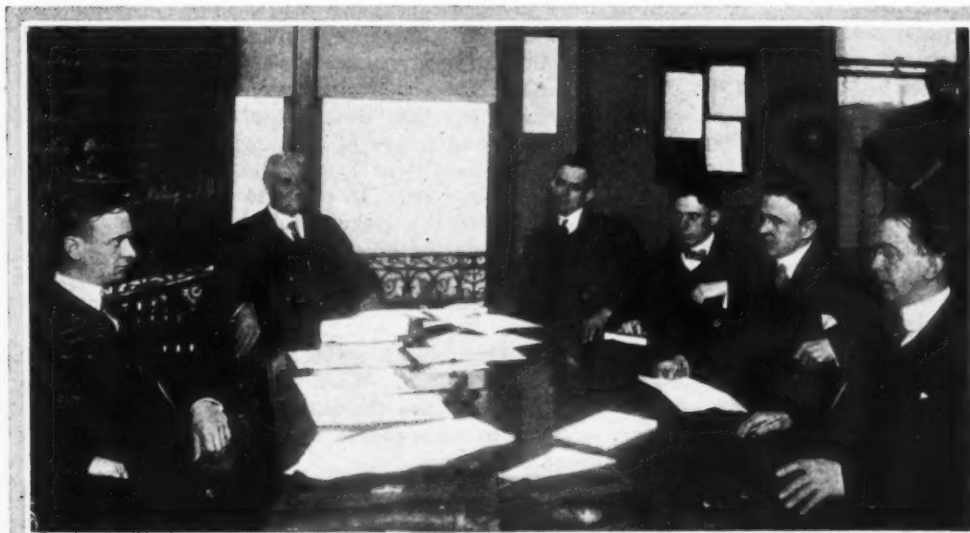
#### Exchanging Standards

A phase of the standards committee work which has made gratifying progress is that taken in hand by the standards exchange division. This newly appointed committee which has for its object a harmonizing of S. A. E. standards with those of other engineering bodies, has announced that the American society for testing materials had created an automobile steels committee which had under consideration the adoption of the entire list of S. A. E. steels as they stand. The same progress is being made in the way of spring steels.

A useful feature in the work of the standards exchange division is that in connection with unit power plant. The division is studying the shapes and dimensions of the bell housings used by motor and gearbox manufacturers with a view towards adopting standards so that it will be possible to connect any make of gearbox with any make of motor. If this could be effected it would be a boon to the manufacturers of assembled cars because it would enable them to secure parts and avoid delays which frequently occur in the delivery from other than the usual factories in case of an unexpected demand for particular units.

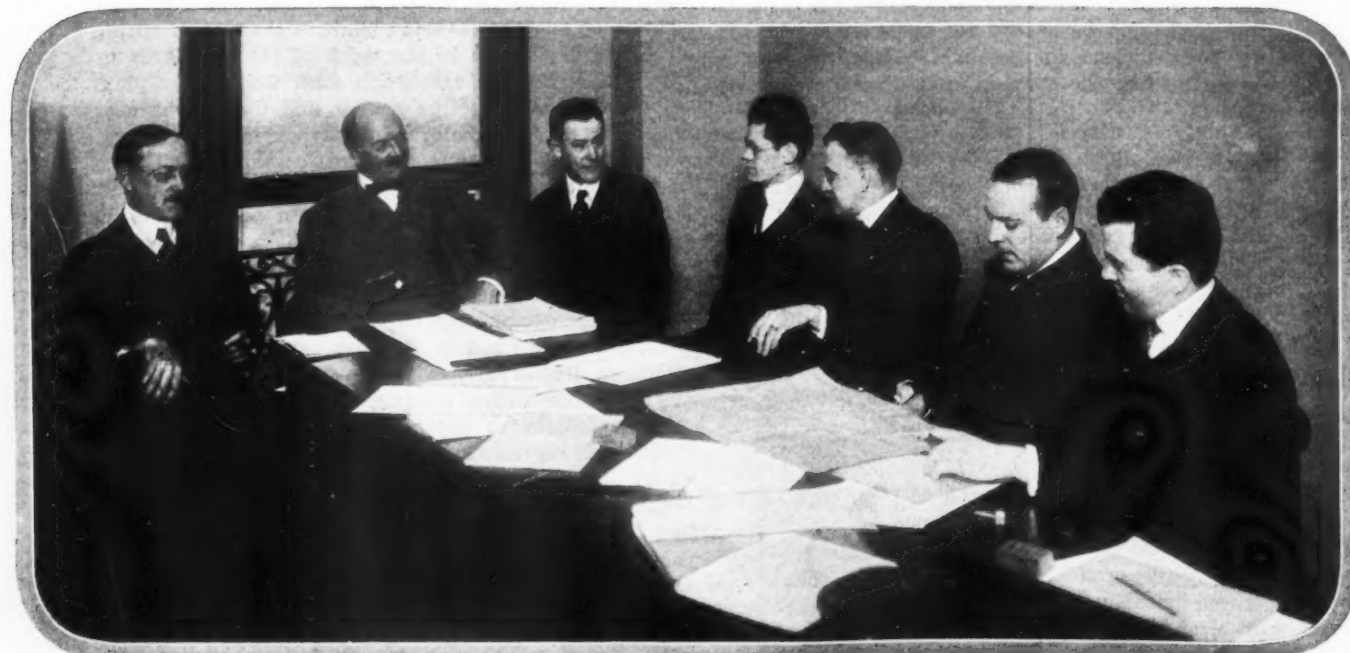
J. M. Hill, representing the promotion interests of the Panama Pacific Exposition in San Francisco attended the standards committee meeting for the purpose of pointing out the importance of having the Society of Automobile Engineers well represented at the coming exposition. He particularly emphasized the need of having competent automobile engineers to supervise the work of erecting the buildings, etc., to be used in connection with the housing of the exhibits and tests. It will be remembered that at the summer meeting it did not seem probable that a majority of the members would favor a meeting of the society next summer on the Pacific Coast. The reason which appeared to be advanced was that there would not be as good an attendance as would be the case were the meeting held in the middle west.

# S.A.E. Standards Men in Session



Left—Research Division, Left to Right—D. L. Gallup, R. C. Carpenter, J. A. Moyer, C. B. Veal, D. Roesch, W. T. Fishleigh

Right—Spring Division, Left to Right—W. T. Norton, Jr., W. M. Newkirk, J. G. Utz, C. E. Clemens, R. L. Morgan



Pleasure Car Wheels Division—H. L. Barton, Henry Souther, R. S. Bryant, E. R. Hall, C. C. Carlton, C. B. Williams, C. J. Welch





Right—Electrical Equipment Division, Left to Right—H. G. Osburn, T. L. Lee, Alex. Churchward, C. M. Bunnell, R. J. Nightingale, Alden L. McMurtry, H. W. Harper, J. G. Perrin, Leonard Kebler, Joseph Bijur



Left — Electric Vehicle Division, Left to Right—Standing, E. J. Ross, Jr., W. S. Holland, J. R. C. Armstrong, W. P. Kennedy, C. A. Ward. Sitting—A. J. Slade, F. A. Whitten, H. S. Baldwin, E. R. Whitney, G. W. Wesley, W. H. Conant

Right—Ball and Roller Bearing Division, Left to Right, F. G. Hughes, F. M. Germane, C. H. Clement, B. D. Gray



Below—Truck Standards Division and Commercial Car Wheels Division, Left to Right—Russel Hoopes, C. J. Welch, H. B. Coleman, E. R. Whitney, T. V. Buckwalter, C. E. Clemens, A. H. Ehle



# Canadian-American Firms to Make 36,000 Cars in 1915

Six Plants of This Character Now Operating, One Being a Truck Firm—  
Other Plants in Preparation—Large Proportion of Output  
Exported—Liberal Inducements for Plants

**D**ETROIT, MICH., Nov. 2—Thirty-six thousand automobiles will be made in 1915 in the Dominion of Canada by Canadian-American automobile manufacturing concerns, or Canadian companies building or assembling cars of American origin.

## Six Canadian-American Plants

There are now only six automobile manufacturing concerns in Canada which make or assemble American cars, or cars having an American name. These concerns are the Ford, Studebaker, Reo, McLaughlin-Buick, Hupp and Gramm companies.

The R-C-H, Olds and Keeton plants have been discontinued. The plants of the Willys-Overland and Regal companies are not yet in operation. The Maxwell company has only general headquarters in Canada for distributing purposes.

Of the six concerns making or assembling cars, the Ford Motor Co. of Canada, Ltd., Ford, Ont., is by far the biggest. While during 1914 the total production will be 18,000 cars, the schedule for 1915 calls for 30,000. About 1,400 is the average number of men employed, but, this year, owing to the war, only 800 are on the payroll.

Established in 1904 with a capital stock of \$125,000 fully paid up, this capitalization has been increased to \$1,000,000 in 1914, and, like the parent company in Detroit, Henry Ford is the president and James Couzens the vice-president of the company.

Ten years ago the plant had 40,000 square feet of floor space, while today the total is 375,000 square feet.

The Ford officials of Canada are not very optimistic as to the business outlook in Canada. They say that under ordinary circumstances the outlook would have been splendid, but, under the present war conditions, which affect business in general to a great extent, one cannot make any predictions as to whether business will be good or bad next year. At the present time it is quiet.

## 1,600 Studebakers in 1914

Next to the Ford comes the Studebaker Corp. of Canada, Ltd., Walkerville, Ont., which was established in 1909 with a capital stock of \$400,000 which has remained at that figure ever since. In 1914 about 1,600 Studebaker cars were made in Canada and for 1915 the schedule calls for at least 2,000.

The Studebaker officials are not only optimistic about the future of the Canadian automobile business, but, they believe that, as a matter of fact, 1915 will be the best year since the automobile was introduced in Canada.

Speaking on the subject one of the officials recently said: "Despite the disturbed condition of finances because of the European war, there is every indication that there will be more cars placed in Canada next season than ever before. Canada, being largely an agricultural nation, is already feeling the effects of the higher prices farm produce is demanding, and farmers are buying more freely than they have for several months."

The Hupp Motor Car Co. of Canada, Ltd., Windsor, Ont.,

started in business in 1911, the plant then having a total floorspace of 2,500 square feet. The output that first year was 175 cars made by a working force of fifty-six men.

In 1912 the shop men totaled 140 and 300 cars were made. In 1913 the production totaled 450 cars and 200 men were in the plant's employ. This year fifty men were added to the force and 550 cars were turned out. For 1915 the schedule calls for 600 cars and 250 men.

"In general, the business outlook is fair," said an official of the company. "It would have been a very good year without the war. People are very conservative and are spending money only for actual necessities and they keep the balance in the banks. While there will always be buyers of automobiles there is no doubt that the purchases by Canadians will not be heavy next year if the war lasts till spring. In some sections of the Dominion the outlook is better than in others, reports from Manitoba and Ontario, for instance, being fairly satisfactory thus far, while those from St. Johns are not as good."

## Reo's Real Factory

The Reo Motor Car Co. of Canada, Ltd., located in St. Catharines, Ont., started in business in 1909 with a capital stock of \$40,000 and a factory having an area of 26,000 square feet. Since then business has steadily increased and at present the plant occupies 71,000 square feet of space and the capital stock has been increased to \$200,000.

This plant is as completely equipped as the Reo plant in Lansing to take care of the manufacturing, from the raw material to the finished product.

Speaking about the business in Canada at the present time and the outlook for the future, general manager E. E. Turnbull said: "At the present time conditions are undeniably unsettled owing to the war in which Great Britain is involved. This is chiefly noticeable in the falling off in fall business, of which there is usually a very good proportion, and we think that bettering of present conditions largely depends on the success of the allied forces in the present war. Should they be able to bring the war to a conclusion, say early next spring, undoubtedly confidence will be restored and business generally will quickly assume its former standard. On the other hand, if the war is prolonged late into the coming year we are inclined to think that it will have a somewhat depressing effect on business and realize, of course, that possibly this will be even more emphasized in our line of business."

## Buicks Assembled at Oshawa, Ont.

A concern which is much more Canadian than American is the McLaughlin-Buick Co., also known as the McLaughlin Carriage Works, Oshawa, Ont. This company has been assembling the Buick cars in Canada for many years, and, while the frames and power plants come from the home plant in Flint, Mich., they build the bodies and otherwise complete the cars.

This year, it was stated by one of the Canadian dealers



handling the car, 1,200 cars were made while from 1,600 to 2,000 are to be built in 1915.

### One Truck Company

The Gramm Motor Truck Co. of Canada, Ltd., Walkerville, Ont., built about 100 trucks in 1914 and expects to have an equal production in 1915.

"Anyone telling you that the war is not affecting the whole automobile business in Canada, either does not know what he is talking about, or does not wish to tell of the real conditions," said one of the Gramm officials. "While Canada is only indirectly involved in the war, its effects are being felt in all lines of business. The people are spending money only when absolutely necessary and are investing less in automobiles, passenger or commercial cars, than at any time during the last 5 years. This refers however only to the last 3 months, since the war began."

### Willys Not Started

The Willys-Overland Co., which purchased the former Schacht plant in Hamilton, Ont., last January, has not started to build there, but is using the factory as Canadian selling and distributing headquarters. The present European conflict has further delayed the company's original plans.

The Olds Motor Works operated a plant in Canada for some time but have discontinued it, finding it more practical to transact all their Canadian business from the plant in Lansing, Mich.

The Regal Motor Car Co. of Canada, Ltd., which started a plant in Berlin, Ont., about 6 months ago, is not yet operating it, that is, building cars there. Present conditions will still further delay its operation.

The plants of the R-C-H Corp. and of the Keeton Motors, Ltd., were discontinued last year.

The Maxwell Motor Co. of Canada, Ltd., was organized in 1913 in Windsor, Ont. No cars are either built or assembled but the finished product is received from the Detroit plant for distribution, the company being the general headquarters for Canada. However, with its increasing business it is not improbable that the time may come soon when a plant will be operated in the Dominion.

Whatever the conditions will be in Canada in 1915 these conditions will probably not have an important bearing upon the motor car manufacturers, as they will be able to dispose of their output to the British Colonies and to most all other foreign countries as it is a fact that quite a large percentage of the cars made in Canada are exported annually.

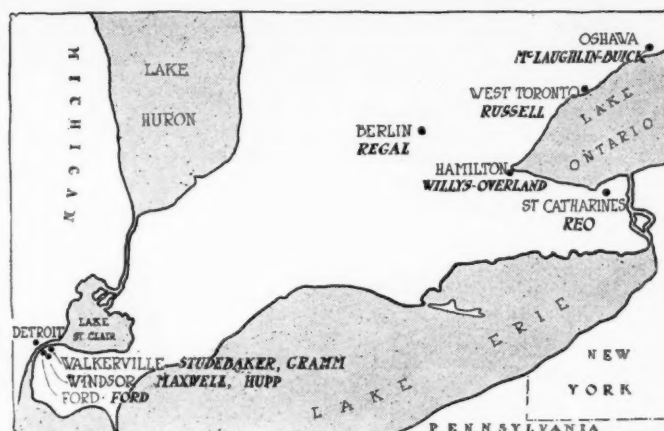
It was stated by a customs official that the Ford company exported fully one-third of its 1914 production, which would make a total of 6,000 cars. The Studebaker Corp., it was also stated, shipped a large percentage of its output to foreign lands.

As this happened under normal business conditions throughout the world, when all those countries where motor cars are made were at peace and exporting a large percentage of their output, it is quite reasonable to assume that now, when those countries are at war, when their export business is nil, it will mean a very large increase of the export business of the Canadian motor car makers.

### Canadian Maker

The biggest Canadian automobile manufacturing company is the Russell Motor Car Co., Ltd., West Toronto, Ont. Its plant is located on a 27-acre site, covers 10 acres of ground and has about 8 acres of manufacturing floorspace. It is stated that over 1,500 men are employed on an average throughout the year and that the 1915 output will be about 1,500 cars. This company makes the Knight type motor.

The company has its inception in the consolidation of the various interests of the H. A. Lozier Co., the Gould Bicycle Co., the Massey-Harris Co., and the Welland Vale Mfg. Co.



Map of part of Canada, showing the locations of Canadian-American automobile manufacturing concerns, that is to say, Canadian firms building or assembling cars of American origin. There are six of these firms in operation, five of them producing passenger cars, while the other builds trucks. Two of the companies included in the map have not yet started active operations in the plants indicated. One other is a distributing station, while the remaining one is a purely Canadian firm

all being consolidated in one factory at West Toronto, operating under the name of the Canada Cycle & Motor Co., Ltd.

Several cars were developed but until 1904 little was accomplished. At that time the plant consisted of about five buildings whereas at the present time it comprises nineteen.

The company has seven branches in the principal cities of Canada as well as many service depots. A large business is done with Australia and New Zealand, directed from a branch depot in Melbourne.

The present capital stock of the company is \$2,000,000.

One of the principal reasons why American automobile manufacturers have established factories or are assembling cars in Canada is due to the liberal inducements offered by the municipalities. In Windsor, for instance, the city grants tax exemptions, free light and free water for 10 years to any new industrial concern employing 25 or more men. This rule is however not strictly adhered to and several companies have started in business with less than 25 men and have been given all the exemptions and other privileges.

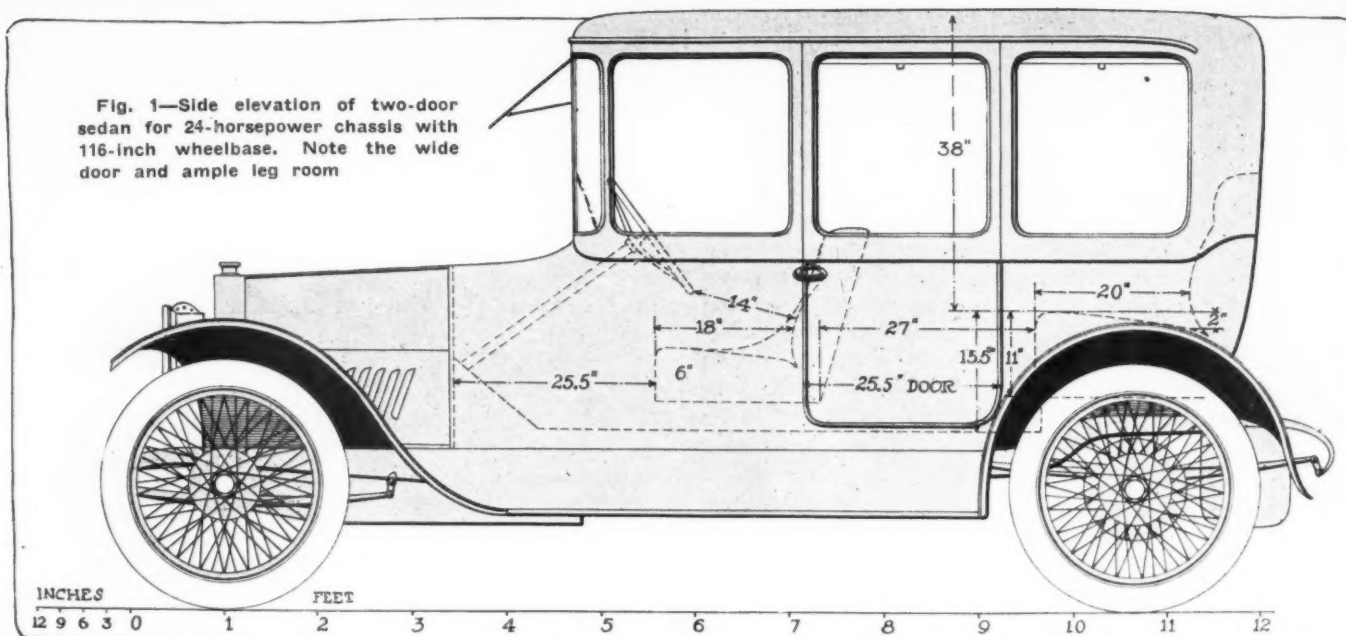
The city-owned land is sold to the firms at the original cost. There are two factory districts. In district No. 2, the price paid by the city for its land was \$850 an acre. It has been appraised at from \$2,000 to \$2,500 recently, yet the land is sold at no increase.

All concerns establishing a factory in Canada must get a Dominion charter, which costs about \$50.

### Chicago Garage Storage Charges Unprofitable

CHICAGO, ILL., Nov. 21—The Chicago Automobile Trade Assn. finds that it is unprofitable for dealers along the row to store cars or bodies for a rate less than \$7 per month for the complete cars or \$5 per month for bodies, either closed or open. The committee that has been investigating has found that the expense of replacing stolen equipment, such as electric horns, speedometers, tail lamps and similar parts is unusually severe. The retrimming of limousine bodies when they have become moth-eaten even under the most minute care, is another item that is very burdensome.

The labor and bother in checking off the stripping from a car, such as carpets, rugs, toilet cases, watches, tires, gloves, chauffeur caps, maps, etc., also must be taken into consideration. The expenses of porters in washing cars and bodies left in storage and constant brushing and cleaning and cost of naphthalene or other moth-preventives among carpets, also is another item that the committee has found to be very expensive.



## Two-Door Sedan with Separate Front Seats

A Design which Gives the Car a Low, Compact Appearance—  
Metal Panels on Wood Frame — Construction Features

By George J. Mercer

ONE of the most pleasing inclosed single-compartment body designs that has been brought out this season is illustrated and described herewith. As illustrated, it is mounted on a 24-horsepower chassis with a wheelbase of 116 inches and having wire wheels, 32-inch tires, three-quarter elliptic rear springs and a sloping type of hood.

The sedan body having a single door in the middle on each side is well adapted for a short chassis, as the door can be wide without cutting the lower corner. As shown in Fig. 1 it is 25.5 inches and this allows all the windows on the side to be spaced equally. The door opens direct to the rear seat and the 7-inch passage between the front seats, Fig. 3, allows the two occupants to get in and out.

### Front Seats Are Individual

These seats are individual and are fastened permanently to the floor, the backs are concaved to make them comfortable and the front of the cushions are rounded off to allow passing the change lever. It is possible to put the gasoline tank under these seats or under the cowl or at the rear, as illustrated.

The steering wheel column has the runabout rake and this enables the cowl to be long and the distance from the front of the seat to the dash for leg room is also generous. In Fig. 3 the width of the front and rear seats is shown and in Fig. 1 are the height from the floor to seat and from that to under the roof. These dimensions are standard and the slope of the rear cushion of 2 inches from front to back is less than former practice. Today, however, the public is not calling for the sloping cushion. The rear cushion is 11 inches thick and the front ones are 6 inches.

The low, compact look of this body is partly due to the rounded roof and round front corners. Fig. 3 best illustrates

the rounded front as well as the near-flat look of the sides. The taper of the body from back to front is very slight, as the width across the outside of the body is only slightly greater at the rear seat than at the front.

In Figs. 1 and 2 the round front corners are shown formed by curved glass. These corner glasses are permanent and the framing to which they are fastened on their front edge is of metal and narrow, while the front windshield is 34 inches wide. This, with the rounded corners, gives the driver a more unobstructed vision than any other style of body. In addition, the round corners and roof give the body non-wind-resisting features. The front glass is divided, the upper swinging outward to form the storm visor and the lower part swinging inward to provide ventilation. All the side glasses are made to drop and, with the exception of the one on each side at the rear of the door, drop their full length. In Fig. 4 the rear glass is shown. This is large and stationary. The rounded corners of the window openings conform in design to the rest of the body.

### Metal Panels on Wood Frame

The construction of the body is with all-metal panels over the customary wood framing, the entire outer surface being metal covered including the roof. The sheets forming the cowl and the body's lower sides, including the doors and the lower back, are of 16-gauge aluminum. The skeleton upper part of the doors, the windows forward of the doors and the front are aluminum castings, but the upper back, side panels and roof can be either all steel or steel and aluminum.

Joints will have to be made where the roof and back panels meet, and, as there are no mouldings to cover the joints except the side drip moulding, which terminates at the rear window, the joint across the roof must be flush finished. This



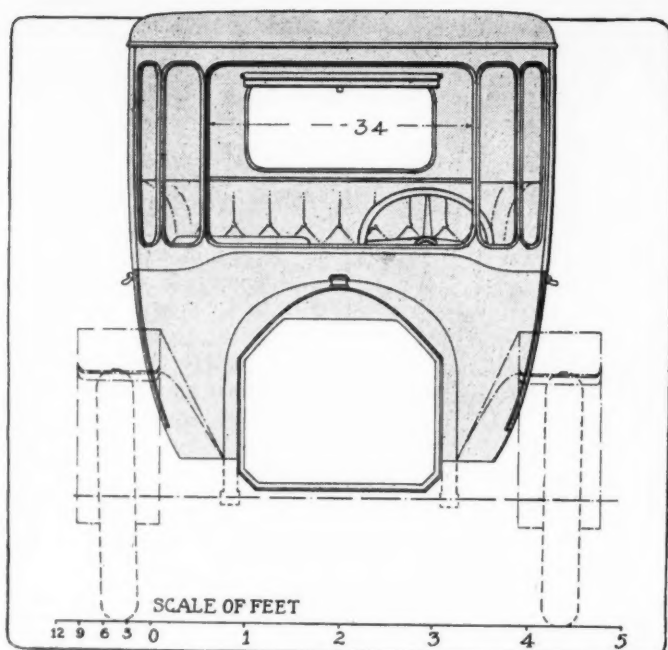


Fig. 2—Front view of sedan, showing how the cowl blends into the body lines

can be done, whether the metal used is steel or steel and aluminum, by fastening the edges of the metal with wood screws to the wood framing, first putting under the joint a steel strip wide enough to lap under both sheets. Then, after the outer sheets are secured with screws, the joint is filled with solder, the steel strip underneath helping to hold this permanently.

#### Method of Applying Panels

All the panels are assembled on the body without mouldings to cover the joints, the upper side panels being put on over the top edge of the lower panels. The metal of the upper panels is turned under and hooked over a steel band bolted through the wood framing. This is a standard form of construction and while it costs a little more, it gives the body a clean finish that is well worth the difference.

When the roof is made of metal, as here specified, it requires that the under side must be well backed up with deadening in the shape of wood and felt to prevent the bell sound or synchronizing of the metal ring.

The roof and window lines are straight until they flow into the rounded corners. This is accentuated by the flat sides caused by the width of the body being nearly the same across at the back and front and by the cowl, which blends easily with the body lines and gives a long appearance to the hood.

It is not considered so objectionable today as formerly to

make chassis changes, such as changing the hood or the rake of the steering column or the mudguards, in order to accommodate a special design of body. In fact no opposition is offered by the dealer if the change in the chassis will make the assembled car a harmonious whole. Fortunately no changes from the standard chassis, provided it has the run-about rake to the steering column and runabout guards, will be required in order to fit the design here illustrated. The dash is made integral with the body which will require a little re-assembling and the gasoline tank will perhaps have to be re-located. The rear guards also will have to be either fitted to the body or re-made, but this is generally necessary in all new closed bodies. This design calls for a small wheel house as indicated in Fig. 4 by dotted lines. This is simply a flattening of the round or bulge of the panel and will not call for extra framing inside.

#### Two Combination Lamps

Two light combination lamps are used at the front, no pillar or dash lamps being included, while inside there are two dome lights centrally located and possibly a small finder light under the cowl to read the instrument board. A few cars have had a glass panel let in at the top of the cowl to light inside, but this has not found much favor as it is not often seen. This body is for winter use and therefore the trimming should be luxuriously thick. On the rear seat, arm rests are used on the sides and the seat is wide enough to have a division in the center. This can be made removable when a child or small person is crowded in as a third occupant. Arm holders should be used if a middle division is not installed, and these are made on a rod to slide to the desired position.

Choice of trimming material should lie between the imported silver-gray Bedfords and the slightly darker mixed goods, if the car is to see rough usage. The darker material will last longer without showing soil marks. The entire inside of the body should be trimmed, and the only wood finish be the garnish around the windows. This can be any of the woods commonly used and it should be richly stained to bring out the grain and to protect it from being injured by moisture.

#### The Finishing Touches

The frameless glass is raised by lift straps of broad lace and these are now put in so that the end is dropped into a slot back of the trimming, the top entrance to which is through the garnish rail. This does not mar the trimming line, except at the door, where it is necessary to have fasteners to hold the glass in different positions. These fasteners are nickel or silver finished to match the dome light metal and the toilet articles as well as the rod on which the arm holder slides. Less lace is used now than formerly and in some cases the broadlace is eliminated except for the window lifts.

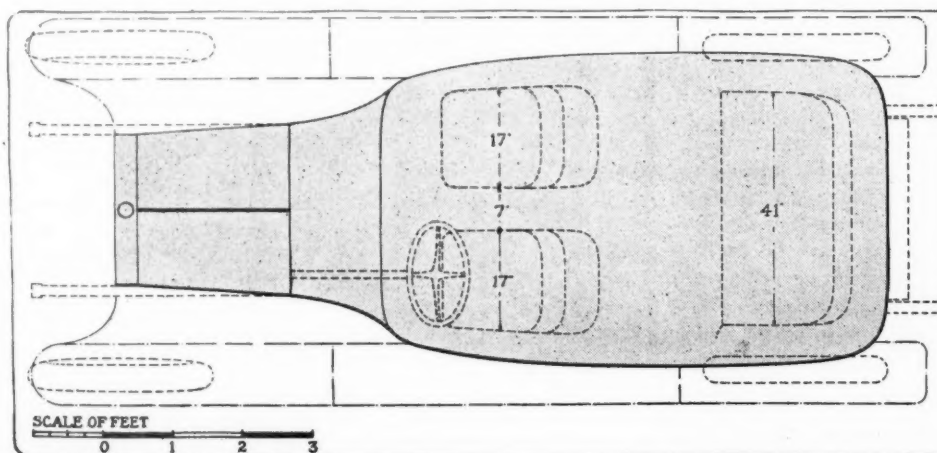


Fig. 3—Plan view of sedan, showing cowl and body lines and seating arrangement.

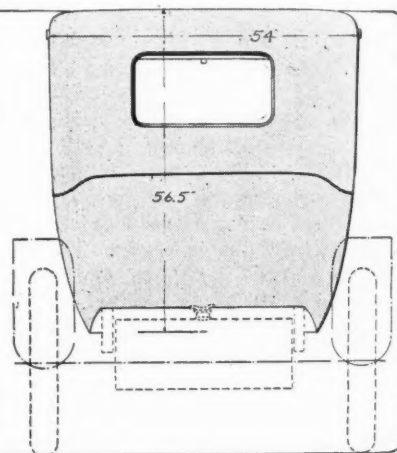
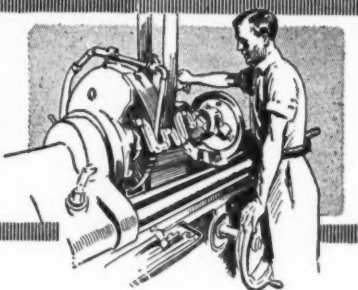


Fig. 4—Appearance of the sedan from the rear

# The Rostrum



*This department is for the instruction of the readers and all are at liberty to ask questions. Be sure to give full name and address that we may send you a reply by letter if there is no space in the Rostrum. If you wish to sign a fictitious name, sign it, also sign your own.*

## Wind Resistance to Reduce Back Pressure

**EDITOR THE AUTOMOBILE:**—An interesting method, which I noticed recently, of reducing back pressure on a racing machine is that adopted by the Chevrolet company on its two racers. As shown in Fig. 1, the device consists of a straight exhaust pipe about 4 inches in diameter, at the end of which there is a large funnel-shaped piece which catches the onrushing air due to the speed of the car and forces it through the opening. This undoubtedly has a strong ejector action and sucks the exhaust out with it. Since the area of the mouth of the funnel is several times that of the exhaust pipe, the speed of the air through the funnel must be 200 or 300 miles per hour when the car is running at 60 or 80.

Detroit, Mich.

O. R. H.

### Where to Buy Paper Covers

**Editor THE AUTOMOBILE:**—Please give me the name and address of the firm that manufactures paper automobile covers. These paper bags, as some call them, will entirely cover a car and are intended for storing a car during the winter.

Belding, Mich.

JOHN W. ZINDLER.

—According to the Automobile Trade Directory there are two concerns making these bags: the Safepack Paper Mills, 411 Court street, Brockton, Mass., and the Seinsheimer Paper Co., York street and McLean avenue, Cincinnati, O.

### Compressor Objectionable for Racer

**Editor THE AUTOMOBILE:**—What is the objection to compressing the intake gas on a racing-car motor to develop more power?

By intake gas I mean the mixture of gas and air, after passing through the carbureter and before entering the cylinders.

For example: Suppose the intake gas is held at a uniform pressure of 2 pounds. Increase the cylinder clearance so as not to bring the compression over 80 or 85 pounds. Strengthen the pistons, connecting rods, cylinders, etc., if necessary.

Why would not the power of the motor be greatly increased especially on small motors? If a failure, why?

San Gabriel, Cal.

E. H. BUCHNELL.

—It is not likely that increased power would be obtained. Let us understand the conditions first of all. Consider a high-speed racing motor 4 by 7 inches. Its compression would possibly be 120 pounds gauge and its clearance approximately 18 per cent. of the displacement of a single piston. Suppose we double the clearance so that twice the charge may be taken in. In order to maintain the compression at 120 pounds, it is necessary to supply the intake air at a pressure of 25 pounds per square inch.

Although twice the charge is taken in, the explosion pressure will be no greater, because the clearance space is double. However, the expansion curve will not drop in pressure so quickly as the piston moves out because there is more gas

to be expanded in the same piston displacement. Therefore, the pressure during the working stroke will be generally higher, or in other words the mean or average pressure will be increased. But with this increased power has come a greater consumption of power by the motor, so that it is doubtful whether there is any net power gain. It takes power to overcome the friction losses in the compressor, and it takes power to compress the extra amount of gas. Furthermore, the compressor mechanism, since it must handle large volumes of gas, is bulky and adds considerable weight, which still further cuts down the effective power output. Possibly the space the compressor requires necessitates the lengthening of the chassis, which adds still more weight. Therefore it is seen that little would be gained by adopting your suggestion.

An increase of 2 pounds in the pressure would make little difference.

### Wants Radiator Design Data

**Editor THE AUTOMOBILE:**—If you have any information on radiators for internal combustion engines, giving rules for the radiating surface, generally allotted per horsepower, and the proper relative proportions between cross-section area of air passages and their length, etc., I would highly appreciate it.

Waynesboro, Pa.

G. ANDERSON.

—We have no data on this subject. The amount of radiating surface depends on the speed of flow of the water, the rate at which the air is sucked through and the construction of the water passages. It is impossible to give exact rules except for a given radiator design. We would suggest that you select the type of radiator you wish to use and ask the manufacturer's advice as to the size of radiator, size and speed of pump and fan, giving him the details as to the motor.

### Should Fit New Springs

**Editor THE AUTOMOBILE:**—My car is a 1911 model with three-quarter elliptic springs in the rear, the small bottom leaves of which have given trouble from within a few months of purchase, new, by first flattening and then cracking in a clean, straight line, not at the bolt hole, but at the front end of the spring bed-plate which is welded to the axle. I prolonged the breaking periods by inserting extra leaves, but

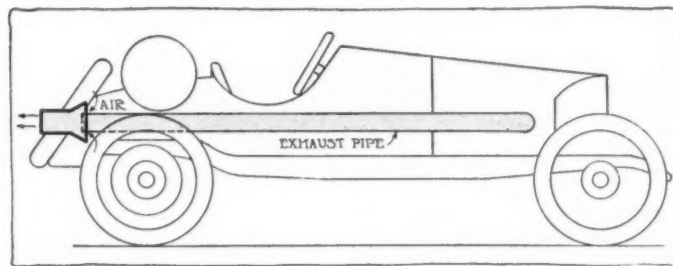


Fig. 1—Chevrolet racer, showing method of reducing back pressure



they finally gave way also; therefore I am wondering whether these breaks are caused by the fact that the car is not equipped with radius rods, that is, a short rod on each side of the car, having a knuckle joint where it is connected to the frame and a simple joint where it is attached to the rear axle by a collar, the same as I have seen on some models of the Buick?

Honesdale, Pa.

BENJAMIN H. DITTRICH.

—Radius rods will not help you out of your difficulty. The best remedy is to obtain a new set of springs from the factory. Radius rods take the driving strain, that is, the forward thrust, but not the twisting strain. Possibly you meant a torsion rod instead of radius rods, as the torsion rod is for the purpose of taking torque reaction due to the rotation of the wheels. However, it would be very difficult to attach such a rod, and it is doubtful whether it would prevent the breaking of the springs.

In the beginning your spring trouble may have been due to overloading the car or to a defective set of springs. Since then you have repaired these springs from time to time as the leaves broke. Probably the repairs were made with spring leaves at hand instead of new ones from the factory.

These springs have now seen at least 4 years of service and are probably worn out, and therefore it would be best for all around satisfaction to obtain a new set.

### How to Install Ammeter

Editor THE AUTOMOBILE:—Please explain fully by diagram how to wire up an ammeter on the Delco System used on 25-B Buick 1914 model?

Cuba, Kan.

L. M. BRIGHAM.

—First cut the strap A connecting the two terminals, as shown at the left in Fig. 2. On some machines this strap is on the inside of the frame as shown at B, in which case it is necessary to remove the motor-generator from the car and disassemble it.

When this is done, a tap is made on the wire from the upper terminal and a wire run from the negative side of the ammeter to the lower terminal.

The meter should be of the center-zero type, reading at least 10 amperes discharge and 20 to 30 amperes charge. The meter will then indicate the current charging the battery and what is discharged from it with the exception of the cranking current. For example, if the lights and ignition are using 6 amperes and the generator is delivering 12 amperes the meter will indicate 6 amperes charge.

### Caring for Batteries in Winter

Editor THE AUTOMOBILE:—Will you kindly advise me the best way to care for the storage batteries during the winter?

Goshen, Ind.

WILBUR RIDEMOUR.

—Keep them fully charged, filled with water and of proper gravity.

The electrolyte of a cell that has been fully charged should be about 1.300. While the gravity of the battery will change with age to a certain extent, it will give good service between the densities of 1.250 and 1.300. When, after testing with a hydrometer, it is found that the gravity is above 1.300 with the battery fully charged, pure water should be added to reduce it to the proper amount. If the addition of the water raises the level more than a .5-inch above the tops of the plates some of the electrolyte must be removed. Low gravity in a cell is caused by lack of charge, the acid being combined in the plates as sulphate; through acid being spilled; through a cracked jar, and through the accumulation of sediment in the bottom of the jars.

Do not add acid until sure that the battery is fully charged and that there is no appreciable amount of sulphate in the plates. For example, if the electrolyte in the cell should be adjusted to 1.275 when 50 points of acid remained in the

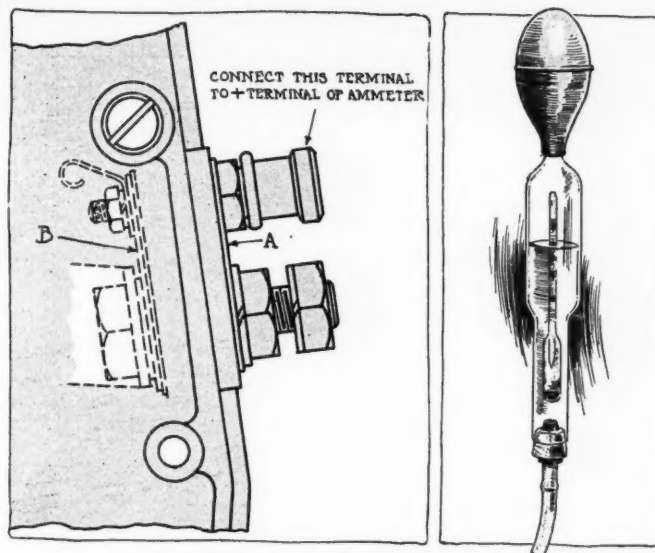


Fig. 2—Left—Diagram showing attachment of ammeter to 1914 Buick Delco system. Fig.—3—Right—Syringe hydrometer for testing the gravity of the electrolyte in storage batteries

plates, the gravity would come up to 1.325, if the cell were afterward charged to its maximum. Therefore it is important to first raise the gravity as high as possible by charging during a period of at least 24 hours at one-half the finishing rate. Then remove the electrolyte down to the tops of the plates and replace with 1.300 electrolyte.

The density of the electrolyte is told by means of a hydrometer, which is a glass float, weighted at the bottom to hold it vertical and with a graduated scale on the upper end to indicate the gravity. The heavier the liquid, the further out from the surface it extends. Therefore the scale reading at the surface gives the specific gravity of the liquid. Evidently with this type of instrument some of the electrolyte must be removed from the cell and placed in a convenient vessel. To obviate this difficulty the hydrometer syringe shown in Fig. 3 was devised. The liquid is drawn into the syringe, in which is contained a hydrometer and in which the hydrometer is floated. It is seen that the syringe makes a more convenient containing vessel for the liquid. There is no danger of spilling the acid during the operation, and it is much quicker and simpler than the other method. Care must be taken in using the syringe not to allow the hydrometer to touch the sides of the syringe, as the friction might alter the reading. For this reason the syringe should be held vertical when it is read.

It is well to note that the gravity of the cells under normal conditions is an indication of the state of charge, and when the gravity has dropped 100 or 150 points it is evident that recharging is required.

### Two Ways to Store

There are two methods of storing batteries. One for periods of less than a year and the other for more than this time. The former is known as wet storage and the latter as dry storage. Dry storage is also used where a battery is to lie idle for less than a year but is in such a condition as to require dismantling for cleaning or repairs at the end of this period.

The wet storage method is very little trouble. The battery is given an equalizing charge and water is added every 2 to 4 weeks, depending on the temperature, and therefore on the rate of evaporation. At least once in 4 months the battery should be charged at one-half its normal finishing rate until all the cells have gassed continuously for a period of 3 hours.

Dry storage requires that the battery be completely taken apart, after it has been given an equalizing charge, cleaned and all worn out parts replaced. It is best to make a sketch

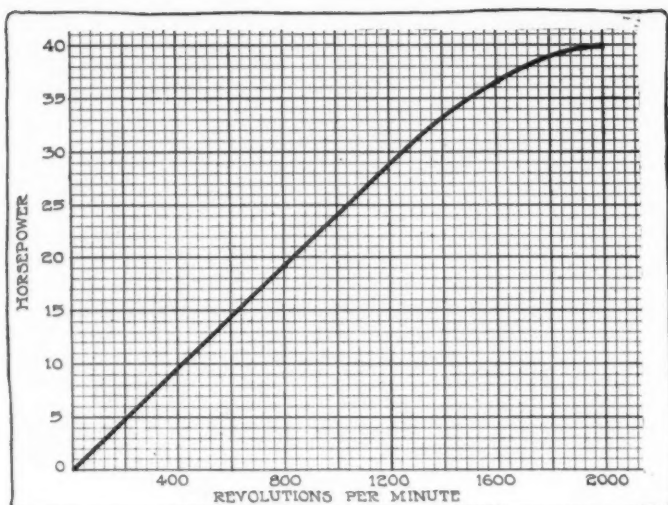


Fig. 4—Horsepower curve of Jeffery four motor measuring 3.75 by 5.25 inches

of the parts, so that no difficulty will be experienced in assembling it again.

The rubber separators should be washed and stored away. The positive plates are put into empty jars and the negative groups are placed in the remaining jars and the electrolyte which was saved for this purpose is poured over them and left there for 5 hours. It is then poured off, and the plates are stored in the empty jars.

#### Questions Concerning Jeffery Four

Editor THE AUTOMOBILE:—Will you please give me the following information regarding the 1914 Jeffery four:

- 1—Horsepower curve.
- 2—Gear ratio.
- 3—Explanation of steering gear and its adjustment.
- 4—What is the easiest way to change the lubricant?
- 5—Sketch the oil system.
- 6—Illustrate the gasoline pressure pump.
- 7—What is the metric size of tires that replace 34 by 4 tires?
- 8—Does a spark plug gather more carbon than usual if the porcelain is broken; if so, why?
- 9—How can I clean the radiator with soda?
- 10—Why does a Vesta 1913 type generator, model D2, properly set, only furnish 3 amperes of charge, running the car at a speed of 20 miles? The car is a 1913 Buick, model 30. The gear ratio is 1 to 1½, silent-chain drive, and wiring is all right. Can you advise me of some method to better the current output?

South Bethlehem, Pa.

L. F. ORLANDINI.

- 1—The horsepower curve of this motor is shown in Fig. 4.
- 2—The gear ratio is 13 to 51 on direct.
- 3—The steering gear is of the worm and gear type. The gear is mounted on the squared shaft of the bell crank. If worn, the gear should be removed and revolved one-quarter turn, bringing into action a new section.

The bell crank connects with the knuckle steering arm by means of a fore and aft rod. The rear end of this rod is adjustable. To adjust, back off the lock nut, loosen the bolt in the hood and turn the ball and socket until the proper adjustment is obtained. Do not tighten it so that it will bind.

4—There is an oil drain in the form of a petcock on the left side of the motor at the bottom of the crankcase. Turn this on and allow all the oil to flow out. Then put a quart of kerosene in the oil filler opening and turn the motor over a few times to distribute the liquid. This will cut any gummed oil and will carry the sediment to the bottom of the crankcase, where it will flow out of the drain. Finally fill the system with a good quality of medium-grade oil.

The oil should be drained out every 2,000 miles, according to the Jeffery company. The oil reservoir should be filled every 200 miles. On the right side of the motor there is a gauge with high and low points marked on it.

5—The oiling system is illustrated by diagram in Fig. 5. It is a combination splash and pressure system. The bottom of the crankcase forms an oil reservoir or sump. Oil is drawn from the sump through a rectangular-shaped screen by a plunger pump worked by an eccentric on the camshaft. The oil is forced to a pipe extending the length of the crankcase in the upper right side. From this pipe oil is fed to the main bearings, camshaft bearings, timing gears and connecting rods. A metal trough retains a supply of oil for each connecting-rod. The splash of the rod dipping into the trough lubricates the pistons, wrist-pins and cylinders.

Surplus oil drains back to the sump, whence it is drawn again for circulation through the motor. A gauge on the dash indicates the oil pressure. If the hand is stationary and at zero, the pump is not working, and investigation should be made.

6—The gasoline pressure pump is illustrated in Fig. 6.

7—The corresponding metric size is 875 by 105 millimeters. This shoe will fit a little loose on a 34 by 4-inch rim. Therefore, if it is applied to a clincher rim do not fail to use lugs. If a quick detachable rim is used, care must be taken while the tire is inflated, because there is danger of the bead coming off, although after the tire is fully inflated it will stay put.

8—If there is a generous supply of oil it is possible that the plug will soot quickly, due to the fact that the crack allows the current to short circuit part of the time and the cylinder misses. Therefore the oil which accumulates on it during the three strokes preceding the power stroke is not burned off. When several explosions are missed in succession the amount of oil settling on the plug is considerable, and when an explosion does occur the intense heat burns and vaporizes some of the oil but leaves part of it in the form of a carbon deposit on the plug.

9—Use a boiling-hot solution containing 1 pound of soda to 2 gallons of water. Pour this through the system until all grease is removed. It must be understood that the soda only cuts the grease and oil, but in so doing it releases a large amount of dirt held by these lubricating materials. If the system is free from grease and oil possibly it will be sufficient to flush the system to remove the sand and grit. If very hard water has been used it may be that the water passages are covered with a deposit, in which case it will be necessary to apply a boiler compound.

10—The driving belt requires tightening. Loosen the three

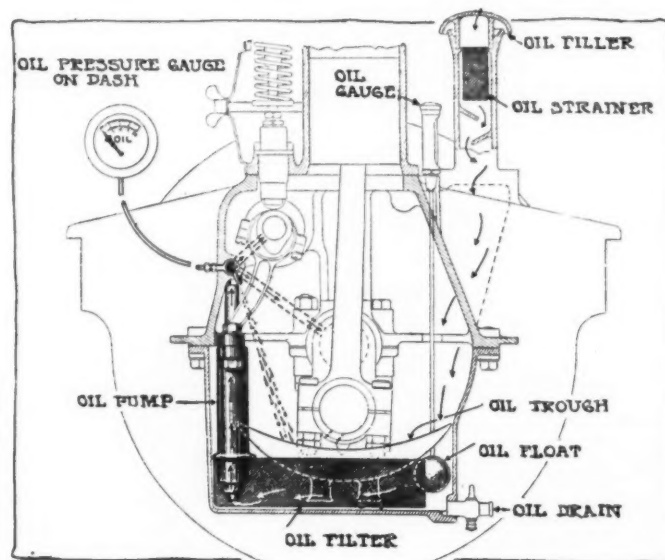


Fig. 5—Oiling system on Jeffery four motor



bolts holding the generator to its base and move it a little farther away to take up the slack.

### How to Straighten Front Axle

Editor THE AUTOMOBILE:—1—I have a front axle of a standard design on a 1910 car. It is bent about 1 1-2 inches from the spring seat to the outer end of the axle, a distance of about 10 inches. I wrote to the makers and they said that it would have to be straightened and heat treated again to make it safe, but that the holes for the bushings were liable to be enlarged by the heat treatment and the axle thus spoiled.

2—What is the customary manner of straightening these, and are they considered safe afterwards?

3—What effect would it have on the steel to straighten it cold, and what, hot?

Harrisville, N. Y.

HUDSON DE GRAFF.

—1—This axle should be heated to a cherry red heat and then straightened. The heat should be applied at the bend only, and as this is 10 inches from the king pin bushings there is no reason why the latter should be heated, and therefore no danger of them becoming enlarged. In fact it is doubtful whether they would be enlarged even if exposed directly to the heat. It is not necessary to give the axle any heat treatment after it is straightened.

2—This is the common method. The axle should be safe after being repaired in the manner outlined.

3—If it were straightened cold it might fracture.

### Wants to Buy Racing Motor

Editor THE AUTOMOBILE:—I want a motor for a racing car, one that I can get high speed from, and come under the 300-displacement. What motor would you advise me to buy?

Los Angeles, Cal.

W. F. GRIFFITH.

—There is no concern building motors of this type as stock. Probably any of the concerns making motors will be glad to build a motor to your specifications. Write the Wisconsin Motor Mfg. Co., Milwaukee, Wis., and F. S. Duesenberg, Des Moines, Ia.

### Ford Planetary Gearset Not Invented

Editor THE AUTOMOBILE:—1—Who invented the planetary transmission used on Ford cars?

2—Who made the first four-cycle motor used on Ford cars?

3—How are the platinum points fastened to screws of a magneto?

4—What advantages are gained in disconnecting the countershaft gears when on direct drive?

5—What advantages are gained by fitting three piston rings to the groove instead of one?

6—Who makes the motor used on the Dodge car?

New York City, N. Y.

W. R. C.

—1—This gearset was not invented but designed. It was produced in the Ford factory and differs only in detail from other planetary gearsets, which have been used on various cars from time to time. It is not an invention, since there were similar ones made before it.

2—This also was made by the Ford company. This concern has always used a four-cycle motor.

3—One method is to hard solder the points in place. The first step is to cut two small slots at right angles in the end of the two members carrying the points. Then by the aid of the brass solder the points are fastened in place.

4—Disconnecting the countershaft gears when on direct drive increases the silence of operation and reduces the wear and power consumed by the friction of rotation. Obviously the countershaft must make a small amount of noise even when it is rotated without doing any driving. Also this rotation causes a small amount of wear, and a slight quantity of

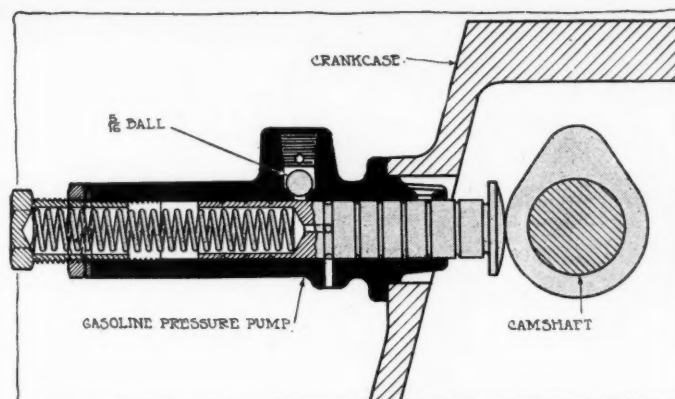


Fig. 6—Fuel pump construction found on Jeffery four

power is used up which might otherwise be employed in propelling the car.

5—The advantages claimed for special piston rings such as this one are that it holds compression better, prevents oil from entering the compression chamber more effectively, and in some cases reduces the wear on the cylinder walls.

6—This motor is made by the Dodge company.

### Kardo Patents Explained

Editor THE AUTOMOBILE:—Will you kindly inform me of what the Kardo patents consist?

Philadelphia, Pa.

B. A. MEYER.

—The Kardo patents are eight in number and govern claims dealing with the gearset, driving mechanism and rear axle construction of the automobile. To quote from THE AUTOMOBILE for March 12, 1914:

The Kardo Co., recently incorporated in Ohio with headquarters at Cleveland and having a capitalization of \$1,000,000, looms up as one of the most important of patent holding companies in the automobile industry, and has as its officers and directors very prominent figures in the motor car field. Alvan Macauley, vice-president and general manager of the Packard Motor Car Co., heads the new Cleveland organization, and T. W. Frech, of the Peerless, is vice-president, and F. C. Dorn, American Ball Bearing Co., is secretary and treasurer. Besides these men, the board of directors of the Kardo Co. includes Milton Tibbetts, patent counsel of the Packard company; F. S. Terry, of the Peerless company, and Walter C. Baker, of the American Ball Bearing Co.

Although the Kardo Co. is incorporated for the purpose of "acquiring, owning and dealing in vehicle patents," its chief concern at this time is with the axle patents of the Packard Motor Car Co., the Peerless Motor Car Co., and the American Ball Bearing Co. These patents have so overlapped and dovetailed one another that some sort of holding company for all of them was necessary to prevent litigation among the three concerns above named. By the transfer of all patents to the Kardo Co. protection is thus gained for all, since all can use the patents of all without conflict.

The formation of this holding concern for these axle patents makes a very strong combination, and since all other axles are said to be infringements of one or more of these patents, it is pointed out that other makers will either have to take out licenses or lay themselves open to litigation.

In a statement issued recently the Kardo Co. says of these patents:

"The patents are now owned by the Kardo Co. Some licenses under them have been granted and the company is negotiating others at the present time. Of course, the usual royalty reservations will be made, and manufacturers will receive licenses that will insure them the right to make and sell to their customers axles that are free from charges of infringement."

The Kardo Co. holds eight patents, as follows: 608,017, dated July 26, 1898, to W. C. Baker, on an anti-friction bearing for use in a front axle; 664,478, December 25, 1900, Hopewell patents, rear axle on removable pinion mounting; 705,304, July 23, 1902, Sangster patent of Packard company, which covers broadly adjustment of bevel gears; 783,168, February 21, 1905, Baker rear axle patent; 792,690, June 20, 1905, on bevel gear drive and compensating mechanism; 950,191, February 22, 1910, on adjustment bevel gearing—this is an improvement on the Sangster patent; 1,013,450, January 2, 1912, on rear axle transmission, and also the re-issue 12,966, June 1, 1909, on power transmission mechanism for automobiles which covers Peerless rear axle with universal joints and removable features.

The patents are described in detail in the issues for March 17 and 24.

In the October 22 issue on page 763 it was stated that the Berliet, a French machine, was no longer imported. Since then Lucien Babel, 371 East Twenty-ninth street, Chicago, Ill., has written us stating that he is representing this machine.



# The Engineering Digest



## An Untechnical Study of the Balancing of Motors—Leading to Fullagar System of Cross-connected Pistons

**T**HOUGH the need of avoiding violent vibrations has compelled motor builders, since the very beginning of the motor boat and automobile industries, to pay considerable attention to the principles involved in the balancing of motors, it is only in recent years that practical construction has followed theory into the last refinements in this matter, the demand for complete silence of motors and the ever increasing motor speed leaving no choice of doing otherwise, while in the case of aviation motors, which are necessarily suspended in a very slender frame, the absence of even the minor vibrations is a condition for keeping intact the tension of the guy wires and the nicely adjusted strength of the whole aeroplane structure.

Probably on no other subject relating to motor engineering does the conception of the practical requirements get snarled up so stubbornly in the multitude of words needed for their adequate and exhaustive explanation. Provisions made for reducing vibrations of one sort are likely to introduce other ones of a different nature and origin, as when the number of cylinders is increased and the crankshaft at the same time is lengthened or when parts are lightened to reduce unbalanced momentums and the loss of rigidity caused by the change is not fully obviated.

The difficulties in presenting the subject so that all can understand it are met by H. F. Fullagar of Newcastle, England, in a paper to be read before the Institution of Mechanical Engineers, by showing simple outlines of constructions in each of which one or another or several of the five different causes of vibrations are eliminated, while—to save a maze of reasoning—leaving it to the reader to grasp from direct contemplation of the construction involved in each case how the end is attained. A rapid survey of the requirements is thereby reached, and this may be found of value, though it will be noticed that the means for neutralizing or avoiding vibration in the four-cylinder motor of standard automobile pattern are touched upon only very lightly, the author's preference running to more radical designs, apparently with aviation purposes mainly in view. His presentation, which

invites discussion in many places, is substantially as follows, with reproduction of his illustrations:

Absolute freedom from vibration involves balance of two kinds, balance of mass and balance of impulse.

### Balance of Mass Only

Balance of mass exists if the inertia forces due to the acceleration of rotating and reciprocating parts neutralize each other and have no external resultant when the engine is driven from an external source.

The balancing of the rotating members presents no theoretical difficulty, provided the crankcase is sufficiently rigid to resist the torque reactions set up.

[The exception may here be taken that the masses should be balanced not only equally on both sides of the axis of rotation, as is usually done, but also as nearly as possible in the same transverse planes, as now done in a number of high-speed motors.]

The inertia of reciprocating parts is compounded of forces which the understanding classifies as primary and secondary, the primary ones being due to the reciprocation in itself and the secondary forces to those irregularities in the speed of the reciprocation which are caused by using a connecting-rod of limited length. Reciprocation as such implies a harmonically repeated reversal of inertia, and the secondary irregularities are also almost simply harmonic in character but of double the frequency. ["Double frequency" is a term not generally used in this connection in treatises on the balancing of motors, but to discuss it would mean a long digression. The inserted sketch Fig. O, indicates the nature of the secondary irregularities. When the connecting-rod A is at B or C, at the largest possible angle with the axis of the cylinder, there is for this reason a relative retardation of the piston speed and this retardation does not occur quite at the moments, indicated by D and E, when the piston speed is maximum by reason of the direction of the crankpin movement. As BFC is shorter than CGB the retardations occur at two unequal intervals, so that the periodicity is not quite simple-harmonic. The portion to the right in the diagram indicates the modification of the irregularities occurring when the cylinders are offset with relation to the crankshaft. The horizontal component of the oblique thrusts between crankpin and cylinder walls, by way of the connecting-rod and piston, should also be mentioned among the secondary

unbalanced mass effects which cause vibration, though stronger components of this kind occur as impulses.—ED.]

Perfect balance of both primary and secondary forces can together be secured only by placing connecting-rods on opposite sides of the crankshaft, Figs. 1 and 2. If as usual the crankshaft revolves, the connecting-rods must be attached to opposite cranks, but if the cylinders revolve, both connecting-rods can be attached to a single crank, Fig. 3. These constructions have however only limited application.

The four-cylinder four-cycle automobile engine necessarily has its cranks in one plane and 180 degrees apart, to give uniformity of impulse, but in this case the secondary forces are wholly unbalanced. When the plane of the

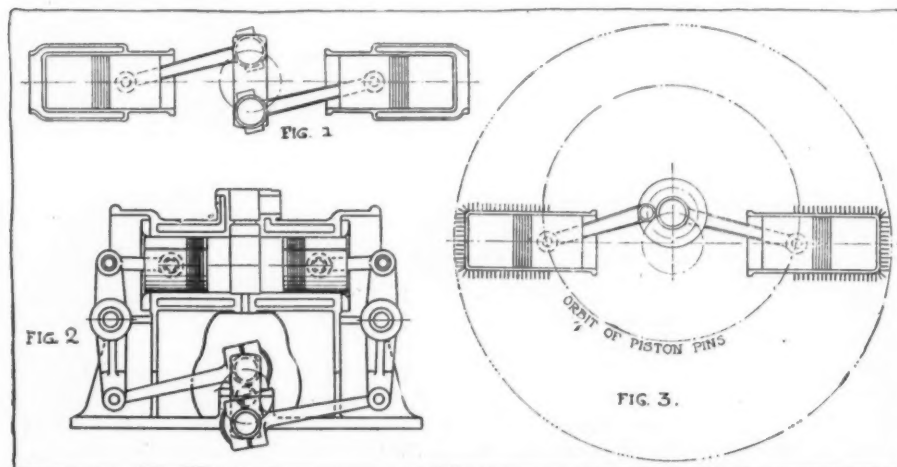


Fig. 1—Mass perfectly balanced. Fig. 2—Mass and impulse balanced; torque unbalanced. Fig. 3—Rotative motor; mass balanced



cranks is horizontal the connecting-rod has moved the piston to below midstroke by the amount  $a$ , Fig. 4, and this amounts to one-sixteenth of the stroke if the length of the connecting-rod is four times the crank radius. As this displacement occurs twice per revolution and affects all four pistons, the secondary forces set free are equivalent to the inertia of a single piston moving the whole stroke but acting with double the frequency. When two such sets of four cylinders are placed

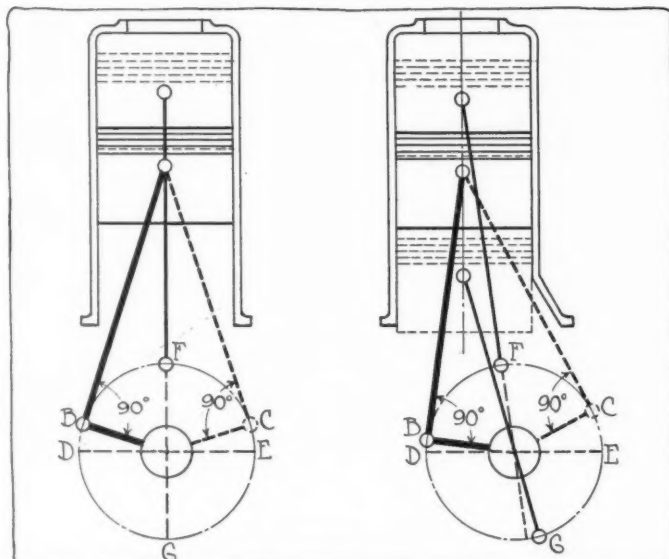


Fig. 0—Diagram indicating relations of primary and secondary forces causing unbalancing of mass. To the right: Same in the case of offset shaft

together in the V-type engine, the secondary forces of each set are unbalanced, and their resultant is 40 per cent. greater than either and acts in a horizontal plane, Fig. 5.

The secondary forces of the four-cylinder engine, Fig. 4, result from the fact that the common center of gravity of the four pistons, instead of being stationary, as would be the case if the connecting-rods were infinitely long, has a small harmonic motion of double frequency. It can therefore be balanced by reciprocating or rotating balance weights driven at twice the frequency of the main piston.

Lanchester's ingenious method of doing this consists in gearing a pair of wheels carrying balance weights to the main crankshaft, which drives them at double its speed and in opposite directions. The centrifugal forces of the weights balance themselves in the plane through the axes of the wheels, and they have a vertical component balancing against the secondary forces.

In four-cylinder motors of the two-cycle type the cranks can be placed at right angles, and it is then possible to secure complete balance of both primary and secondary forces, with the exception of a tendency to rock the motor lengthwise produced by the secondary forces. This can usually be absorbed in the chassis, where the question is of automobiles. Five- and six-cylinder motors of either four- or two-cycle type can be perfectly balanced with regard to the primary and almost perfectly with regard to the secondary mass effects.

To sum up, the motors in common use which may run without vibration when driven from an external source are only the following: The motor with rotating cylinders, ordinary five-

and six-cylinder motors and four-cylinder two-cycle motors with the cranks at right angles. But, when the crankshaft is long, in any of these, it is difficult to make it so rigid that the motor will not tend to vibrate relatively to its flywheel, whose mass center remains almost stationary.

#### Balance of Impulse

Mere balance of mass is however insufficient to produce a vibrationless motor in practice, because, in considering it, no account is taken of the violently fluctuating pressures in the cylinders and the consequent strains in the crankshaft and the motor framing. These strains must be balanced so as to have no tendency to shift the center of gravity of the motor relatively to its crankshaft and points of support.

In Fig. 1, if the cylinders are in line and fire simultaneously with equal charges, there will be no tendency for the motor to move, except, by torque reaction, around the crankshaft, and the design of Fig. 2 secures this result more simply, the piston pressures being necessarily equal. The well-known valveless two-cycle Junker motor Fig. 6, has equality of impulse, but the secondary mass forces are unbalanced. The three cranks of each cylinder receive simultaneous impulses once only per revolution. The crankshaft receives therefore virtually one impulse for every half-revolution. In fact, in this, as in all single-acting motors, the pressures on the pistons during the compression and explosion strokes twist the crankshaft first backward and then forward, producing a severe condition of stress, while the reactions of the cross-heads also alternate in direction with each stroke.

If a second pair of cylinders, each with a pair of pistons, were arranged tandem on top of the first two, making each tandem line double-acting, the cranks of the two sets could be placed at right angles and the balancing of both impulse and mass would be almost perfected, but a motor of this description has great height and many parts, and the same results can be obtained by the author's arrangement shown in Fig. 7.

In this, two open-ended cylinders, each with a pair of opposed pistons, are placed closely together, side by side, and the upper piston of one cylinder is connected to the lower piston of the other by a pair of external oblique tie-rods, as shown. An explosion between A and B drives B down and A up, also drawing up D by the oblique rods, and gives two equal and opposite impulses to the two cranks. The explosion in one cylinder compresses the charge in the other, as the motor operates on the two-cycle plan, the pistons at the ends of their strokes uncovering inlet and exhaust ports, as in the Junker-Oechelhauser arrangement of Fig. 6.

The complete motor has two such pairs of cylinders and a

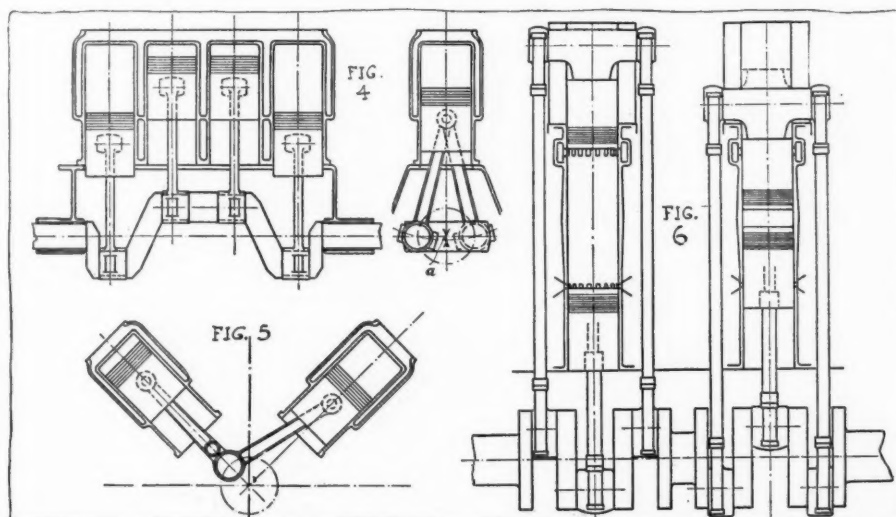
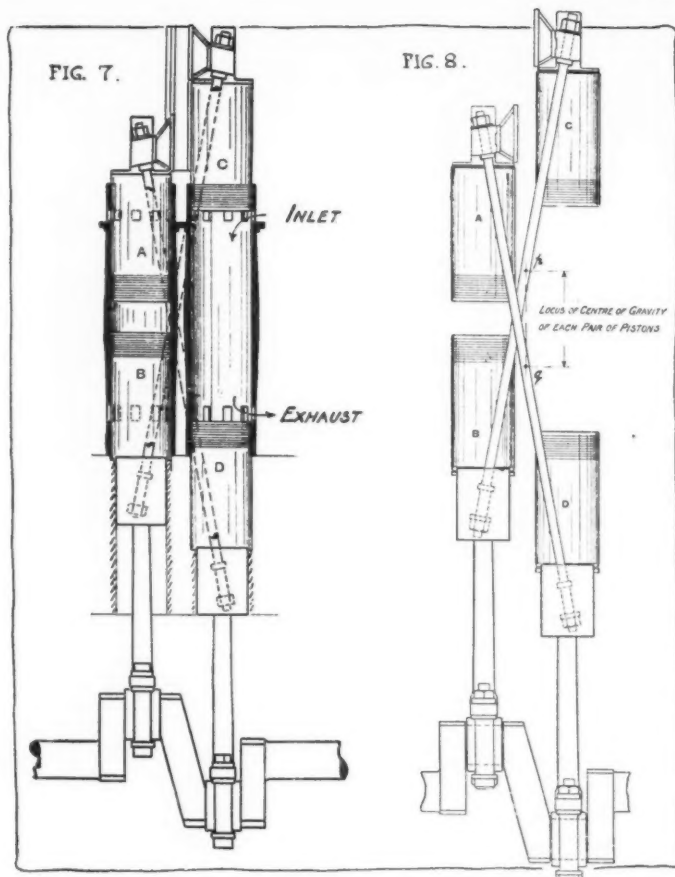


Fig. 4—Ordinary four-cylinder motor; secondary forces unbalanced. Fig. 5—Eight-cylinder V-motor; secondary forces unbalanced. Fig. 6—Junker-Oechelhauser motor; impulse and primary forces balanced; secondary unbalanced



Figs. 7 and 8—Fullagar motor. Mass balanced, both primary and secondary. Impulse balanced if motor is made with four cranks

second pair of cranks at right angles to the first, and the explosions in the four cylinders, acting upon the eight pistons, thus produce eight impulses per revolution. The vertical forces at all times balance each other and are not transmitted through the engine frame.

The pistons of each pair are rigidly joined and form one moving part, as shown in Fig. 8. The center of gravity of the pistons A and D is at the point *q* and travels up and down on the line *pq*, while the center of gravity of the other pair of connected pistons, C and B, is at the point *p* and travels up and down on the same line. The primary forces are thus perfectly balanced. Secondary forces result from the fact that the common center of gravity of all four pistons and their connecting-rods oscillates on the line *pq* with an amplitude which, with a connecting-rod of the length of five cranks, is equal to 1-20 of the stroke of each piston, but this force is balanced by the corresponding force in the other pair of cylinders, and as the two pairs of cylinders are brought closely together, the secondary couple which alone remains, is small. In a six-cylinder motor of the type it could be nil.

The only reactions on the frames of the Fullagar motor are the horizontal thrusts of the crossheads on their guides, and these are always in one direction. A 500-horsepower motor of this type, with 12-inch bores and 18-inch stroke, has been in operation for one year and at 250 revolutions per

minute, which means an average piston speed of 750 feet per minute, develops scarcely any perceptible vibration. Even at 900 feet piston speed the vibration is still slight. The oblique rods cause little friction, as the angle of the rods is less than the maximum angle of the connecting-rods, and the total friction in the motor is less than it would be if each of the eight pistons had its own crank and connecting-rod. While the balance of mass and impulse is very good, there is, however, one unbalanced reaction of the motor, each successive impulse tending to rotate the motor backward around its crankshaft, and there is also the gyrostatic effect of the flywheel, which in the case of application to aeroplanes it might be desirable to eliminate.

The only extensively used motor in which the torque balance, just referred to, has been effected together with good balancing of mass is that which was fitted to Lanchester cars in 1896. As shown in Fig. 9, the primary forces were here balanced by weights on the crankshafts, the secondary forces of the pistons balance themselves, and the torque balance was secured by oppositely rotating flywheels. Balance of impulse was not obtained.

A motor which secures perfect balance of all forces is shown in Fig. 10. Two opposed pistons in a single cylinder are connected to two oppositely moving crankshafts at opposite ends of the motor. The shafts need of course to be kept in co-ordination by a layshaft and screwgears or by a pitch-chain and spurgears, though such a connection has to perform no appreciable work under normal operation. The arrangement has the advantage, for aviation purposes, that two propellers can be driven directly. If two such cylinders are placed side by side and their connecting-rods are coupled to opposite cranks, these rods will then balance each other, and perfect balance of all forces—mass, impulse, torque and gyrostatic effect—will be secured.

By applying the two-shaft principle to the Fullagar cross-connected cylinder construction, Fig. 7, a two-cycle and double-acting motor is produced in which each crank receives two impulses per revolution. An improved arrangement for this purpose is indicated in Fig. 11, where a pair of cylinders with cross-connected pistons is arranged in a plane at right angles to that of the shafts. Two such pairs can be side by side when the cranks are at right angles. Small balance wheels will then be needed to balance the connecting-rods,

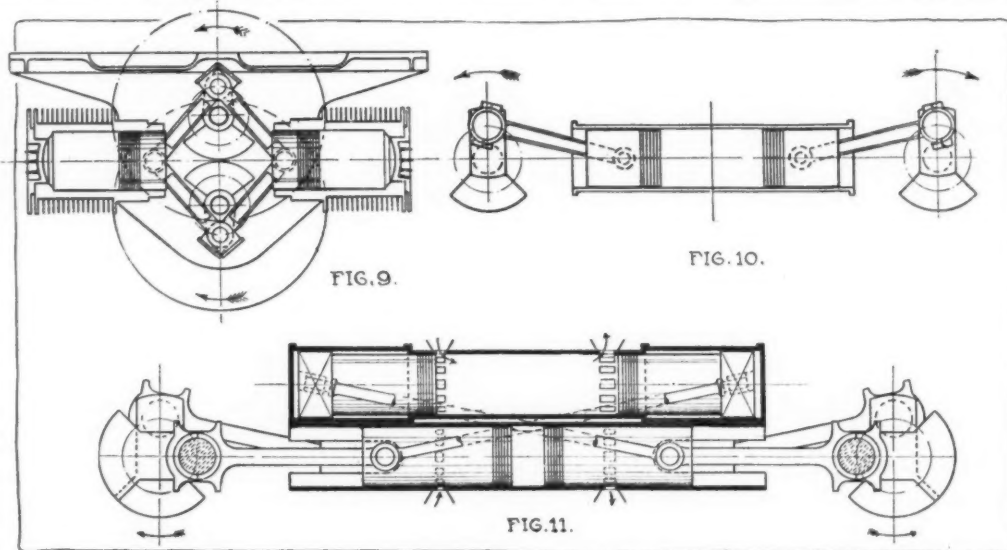


Fig. 9—Mass and torque balanced; impulse unbalanced. Fig. 10—General scheme of two-shaft motor with mass, impulse, torque and gyrostatic action balanced. Fig. 11—Double-acting valveless motor with two shafts and four impulses per shaft per revolution; perfect balance of all five kinds

and four impulses will be transmitted to each crankshaft per revolution. As the cylinders in either case work on two-cycle, an air pump of some kind is required, and in the illustration the two crossheads of each upper cylinder are arranged to act as blowers—a method found satisfactory.



# The Improvement of Spring Suspension

An Examination of the Forces and Movements to which Motor Vehicles Are Subject on the Road and of the Cushioning Devices in Use or Required

By M. C. K.

COMMON unlearned ingenuity and plodding experimental metallurgy share the honors for most of the advancements which have been made in means for cushioning motor vehicles and their occupants against road shocks since the early days when ordinary vehicle springs were accepted as the only available basis for any new development that might be found necessary. Of systematic unfolding of scientific principles, like those which have governed the evolution of motors, there has been little question. No assistance has come from co-operation of investigators or the publication of indisputable data, excepting only the improvements which have been gradually made in the qualities of spring steels and their heat treatment, some of which have been duly tested and recorded. And the principal reason for the wild growth by which the present stage in the "springing" of motor vehicles has been reached, is easily discovered in the fact that it has always been the requirements which were in doubt rather than the means for meeting them.

The requirements are indeed most difficult to ascertain and express, covering an endless variety of conditions, due to the interactions among road, load and speed variations, further complicated by other interactions between springs and elastic tires. The problem of meeting requirements which cannot be specified naturally eludes a systematic and scientific solution, while it appeals to ingenuity and invites compromise, and it is therefore quite consistent with the intrinsic facts of the situation when the present status of the art seems to be characterized by a great multiplicity of loosely related auxiliary devices, all intended to obviate the shortcomings of the standard combination of vehicle leaf springs and elastic tires and representing a corresponding diversity of opinions as to what these shortcomings are.

While in recent years the vehicle springs proper have been modified in several ways—mainly by introducing a rocking motion around their thickest portion, as in cantilever springs, and by trussing two springs to combine strength with flexibility—these modifications have not yet been fully accepted as improvements or widely adopted; neither can it be said that auxiliary devices have been rendered superfluous by them, as, on the contrary, they continue to be used in connection with them.

## Mechanical Requirements Never Defined

So long as nobody has yet been able to formulate sharply and precisely the mechanical actions required of a spring suspension for motor vehicles, no marked unity of efforts toward its improvement or standardization can evidently be expected. Furthermore, the mitigation of shocks, which in the widest term is the object of a spring suspension, is in itself a compromise action from which nothing absolute but only the alleviation of an undesirable effect is demanded. The whole foundation for a discussion of spring suspension principles and devices is therefore still largely one of personal opinion, with only here and there scientifically established facts and laws for guidance, and the most urgent need for making such a discussion fruitful is to get the requirements of a spring suspension formulated in terms of mechanical motion and as closely as possible to the essentials; and these, it may be said in advance, may differ for different

classes of vehicles. The great difficulty is to narrow these requirements down to a working basis so well defined that the mechanical elements in any spring suspension stand in clear relations to them, and yet to have them wide enough to meet with general approval among those most competent to judge. Some general views on the whole subject and its relations to motor vehicle economy and motor vehicle manufacture seem here to be needed in order to make it clear that such a formulation of the essential requirements is desirable as well as possible, as the difficult nature of spring suspension mechanics and the resulting lack of a literature on the subject—excepting always the metallurgical end of it—have made it appear fairly satisfactory to many to go on stumbling toward final solutions rather than attempting a short cut through a systematic standardization of opinions and practical developments.

## General Viewpoints—Relations to Economy

In the matter of economy to the user, the motor vehicle industry aims of course for nothing less in the end than to get back to first cost of transportation by animals, with maintenance expense much smaller, the life of vehicles at

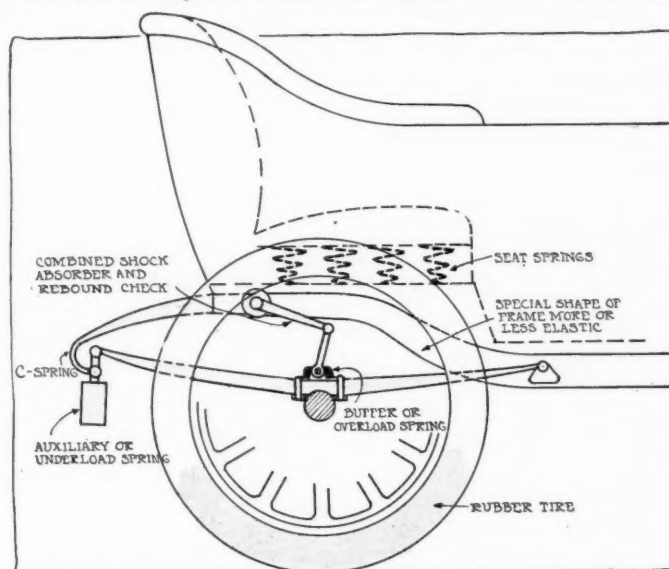


Fig. 1—Diagrams of main organs in modern spring suspension for rear end of a motor vehicle

least trebled by means of suitable repairs, as compared with the average life of draft animals, the speed at least doubled and the daily mileage quadrupled. This aim was taken for granted at the beginning of the industry, and belief in the possibility of realizing it, especially with regard to first cost and maintenance, was the principal motive for creating the industry. It was only later that speed was discovered to be the principal factor which actually operated in practice to make the use of motor vehicles broadly economical through the saving of time.

The great efforts made in the past few years for introducing economies by other means show, however, that an economical diet consisting of speed alone cannot be considered

wholesome. Thousands of forms of transportation exist to which speed cannot be applied, and in these complete economy must come by more natural means. Also much doubt is caused by basing claims for economy on speed, as a high velocity over uneven ground is always more or less destructive and it is difficult to tell where the advantages of wage saving and of business efficiency begin to overbalance losses due to deterioration and repairs. Many hold that speed is already overdone and constitutes a public nuisance, which eventually must be checked. On the whole, the trend of opinion is perhaps toward the idea that speed must in the end become the free gift of motordom to the world rather than a commodity to be sold at the highest possible price. This implies that speed in moderation, yet far higher than any for which ordinary vehicle springs were intended, will always be practiced, and that speed in still higher degree must remain for nearly all vehicles a reserve property, to be utilized in emergencies without severe economical punishment.

#### Fundamental—and Needs Publicity

In the sharp economical development which has been inaugurated and which bids fair to become sharper yet, there will thus be no possibility for neglecting the improvement of spring suspensions, if it is admitted that speed cannot be much abated and that the present relatively high maintenance cost of motor vehicles is closely associated with their shortcomings in this respect. Among other subjects worth studying with a view to the increased economy so peremptorily demanded, that of spring suspensions, including tires, claims most public attention, because it is least recognized among engineering elements and is yet truly fundamental, deeply affecting durability, practicable speed, tires and tire wear, fuel consumption—in fact all the main factors in mechanical economy—besides being the principal one to be considered in the matter of producing driving comfort and security for frail loads.

The great variety of spring suspension schemes and devices which are in the market and, in the aggregate, very extensively used, speak of course loudly enough, if not very articulately, of the great economical importance of improved methods for cushioning against road shocks, but each of them is offered with the claim that it remedies the shortcomings as much as is needed, in one respect or another if not in all respects, and is therefore actually set up as an argument against the need of further discussion. And a similar pressure upon public opinion, making for silence where speech would be more profitable for the general advancement, comes from manufacturers of automobiles and of tires who never cease to warn against the economical dangers of overloads, holding themselves free from responsibility for tire and spring injuries if overloads are carried. By constant repetition of a warning which is in fact completely justified by the actually existing conditions, they have conveyed an impression to the effect that the user is at fault if he overloads—this being so far correct—but this impression is through the imperfections of average logic construed to imply that the manufacturers and the spring suspensions, including the tires, are all that could be expected and that consequently all discussion with regard to urgent improvement would be wasted, at least so long as one opinion is as good as another, in the absence of generally recognized requirements and means for meeting them.

A keener demand for economy must eventually result in recognition of the business fact that overloads are everywhere carried occasionally as a matter of necessity and that spring suspensions or tires which do not respond to this necessity are to that extent in need of improvement, a large margin being required for load variations as well as for speed variations. That the factor of safety should be permitted to be smaller—5 to 10 times smaller—in this respect than for any of the simple mechanical elements in the con-

struction of an automobile or motor truck, is scarcely a proposition for which approval can be expected throughout the future of the automobile industry. The problem must therefore be faced as soon as possible in theory, in order that practice shall not find itself too far behind popular demands.

Before the mechanical requirements of a spring suspension can be formulated, it may be useful to pass in review the objects which it must serve, as some of these are otherwise easily overlooked. In widest generality it may be said that a spring suspension serves comfort under small shocks and security under sharp ones. More in detail the objects may perhaps be listed as follows:

- (1) Protection; (a) for machinery and values, (b) for persons.
- (2) Comfort; (a) in general, (b) to make driver's job less wearing, (c) to subserve safety by keeping the faculties unimpaired.
- (3) Fuel economy; by reducing load lift and tire flexions.
- (4) Speed; since protection, comfort and personal safety determine the speed limits under average American road conditions.
- (5) Reserve speed; which, when permissible, enlarges the range of usefulness of each vehicle and reduces investment.
- (6) Racing speed; an artificial requirement but important to demonstrate, among other things, the fitness of a spring suspension in its totality.

#### Present Complication

The equipment which has been developed gradually to serve all of these purposes already comprises a considerable number of additions to the simple springs which were found sufficient for the more slowly moving vehicles of the past. Fig. 1 presents a diagrammatic view of the organs now found necessary for a complete spring suspension at one end of a vehicle. Spring washers to prevent bolts from jarring loose throughout the vehicle structure come under the same head, and, if the front end of a vehicle is usually suspended a trifle more simply, this is mainly because the standard steering system is influenced unfavorably by large spring action. On the other hand, it is found necessary to give radiators at the front of motor trucks a special spring suspension, and in some cases it is deemed desirable also to hang the motor in a special spring frame. The whole equipment represents a considerable quota of the original cost of a vehicle, while the shortcomings still remaining in it, despite its elaborateness, stand for a much larger quota of upkeep expenses. Simplification would plainly be desirable if consistent with improvement. For convenience in reference a list of the organs or factors which enter into a complete modern spring suspension follows:

- (1) Air tires; with solid rubber tires second choice and solid tires plus elastic wheels third choice.
- (2) Alloy-steel vehicle leaf springs; either (a) long, strong and very flexible or (b) supplemented by auxiliary coil springs.
- (3) Auxiliary coil springs; in all cases when the leaf springs, for economical or other reasons, are chosen stiffer than they are required to be for easy riding.
- (4) Rebound checks; always required to remedy an intrinsic shortcoming in the strength of a leaf spring and to limit movements of the vehicle body under certain road shocks of a certain kind. They are often combined with
- (5) Spring dampers, commonly termed shock absorbers, though this term is proprietary; always more or less useful if the leaf springs are flexible enough—alone or in combination with the auxiliary coil springs—to be efficient for comfort.
- (6) Overload springs or buffers.
- (7) C-springs; while apparently a fashion feature they maintain their necessity because they produce a longitudinal cushioning effect at stops and starts and also a lateral and

(Continued on page 993)



# Chevrolet Continues Four and Six

Six Reduced to \$1,425 and New Body Fitted—  
Four Has 106-Inch Wheelbase and Bigger Brakes

CHEVROLET for 1915 continues to make the two chassis which have been marketed for 1914. These are a four and a six, the latter coming out at last year's automobile shows. The price of this six, which comes only in touring form, has been cut from \$1,475 to \$1,425. On the four-cylinder chassis, Chevrolet puts a re-designed, streamline five-passenger body, calls the car the Baby Grand and sells it for \$875. Or, it fits an attractive roadster body, designates the model the Royal Mail and continues to offer it at \$750. With the Auto-Lite electrical system the four sells for \$110 more.

The principal changes in the four-cylinder car are the wheelbase increase from 104 to 106 inches, and the making of more powerful brakes by enlarging their diameter 2 inches, making them 12 inches. Mechanically, the six is practically unchanged, but it has a new sloping body, which is roomier than that formerly used.

The six-cylinder motor is an L-head 3 5-16 by 5 1-4, with cylinders in blocks of three. Thermo-syphon cooling, constant level splash oiling, and Remy dual ignition are features of this power plant. The driveshaft is inclosed in a torsion tube, bolting at its rear end to the gearbox, the latter being in unit with the rear axle, which is three-quarter floating. Other specifications include cone clutch, platform rear spring suspension, left drive, center control and rear gasoline tank feeding by pressure.

The wheelbase of the six is 112 inches, tires are 34 by 4 and Auto-Lite cranking and lighting are furnished.

The fours have the distinctive Chevrolet motor with valves in the head, rockers and springs inclosed within an aluminum cover plate. Twenty-four horsepower is credited to the engine, whose dimensions are 3 11-16 by 4 inches. The cylinder head is a one-piece casting secured to the cylinder block by bolts, making a compact and readily removable assembly.

## Rear Springs Take Drive

Drive is through a cone clutch to a three-speed gearset, located amidships on two frame cross members. Final drive is by double universal uninclined shaft, torque being taken by a rod and drive by the rear springs, which are three-quarter elliptic. Tires are 32 by 3 1-2 on both roadster and touring car.

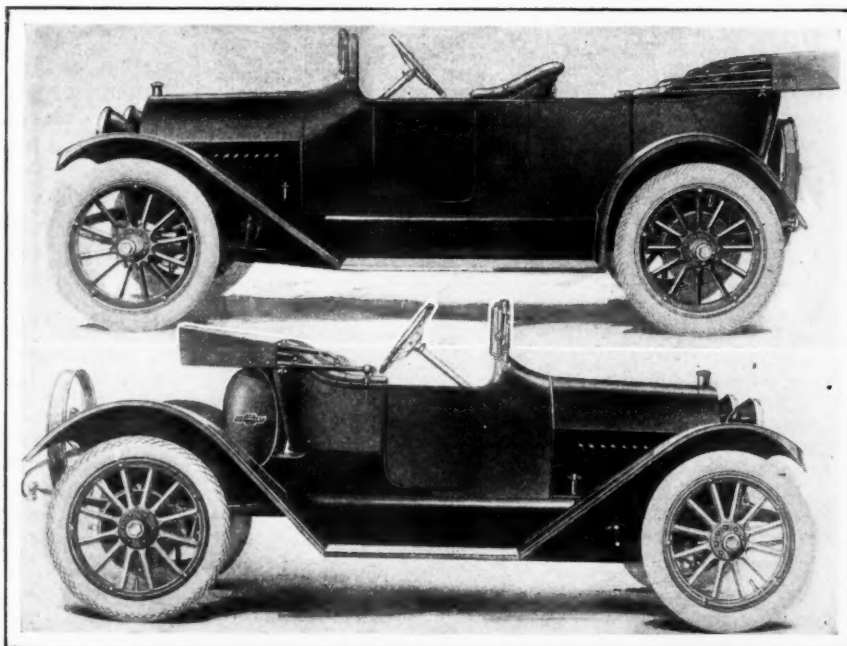
## The Chevrolet Four

The valve-in-head type of engine which propels the four-cylinder roadster and touring car has a displacement of 170.9 cubic inches, and its stroke-bore ratio is 1.08 with an S. A. E. horsepower rating of 21.8.

The cylinders are cast in block form, with the upper half of the crankcase integral with them. The joint at the base of the cylinders is thus eliminated, resistance load being spanned to the crankcase walls and bearings through continuous webs placed so as to distribute the strain. This is reduced on each cylinder individually because of the support given by the adjoining cylinder.

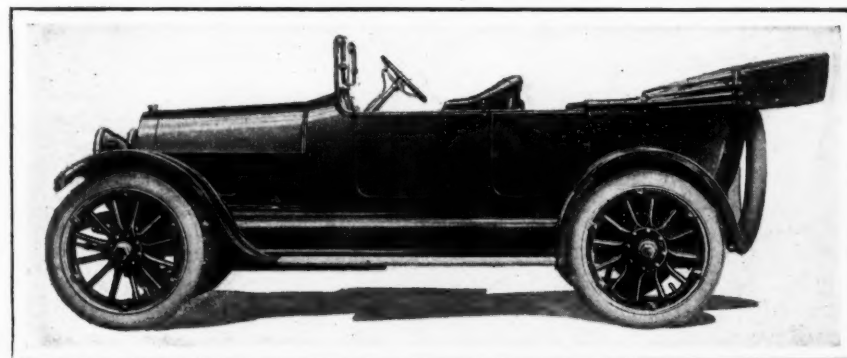
## Detachable Cylinder Head

The head is a one-piece casting secured to the cylinder block by bolts, the joint being made with a copper and asbestos gasket. The special advantage of the separate head

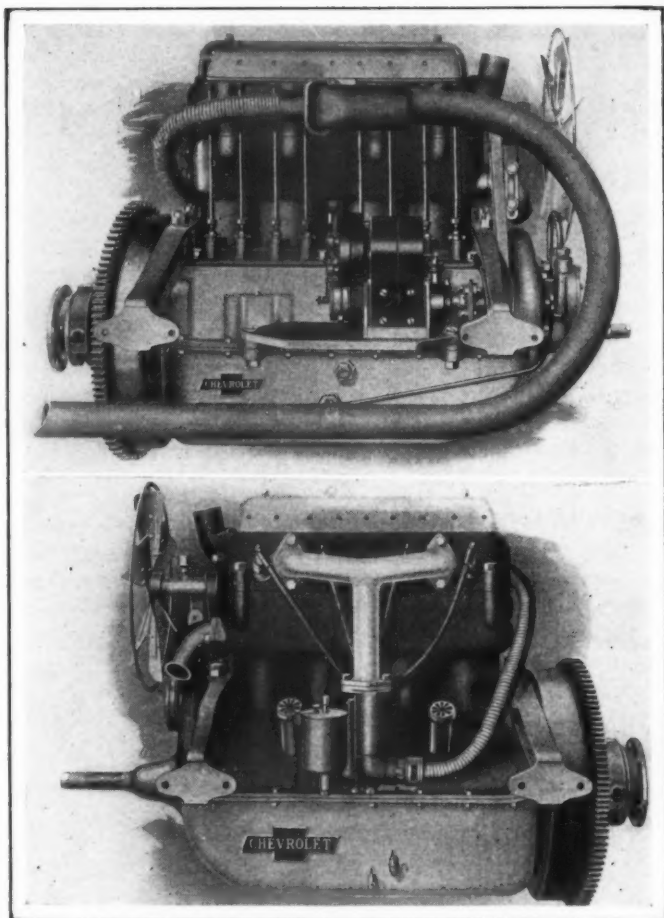


Upper—Four-cylinder Chevrolet Baby Grand touring car, which, with 106-inch wheelbase and full equipment, except electric starting and lighting, sells for \$875. The Auto-Lite electrical system is furnished for \$110 extra

Lower—Chevrolet Royal Mail roadster, which is mounted on the same four-cylinder chassis as the Baby Grand, and sells for \$750 without electric starting and lighting, which is furnished at \$110 extra



Six-cylinder Chevrolet, which has a 26.3-horsepower motor, 112-inch wheelbase and a new roomy body. The Auto-Lite electrical system is furnished at the stock price, \$1,425



Upper—Exhaust side of Chevrolet four-cylinder motor, showing the mounting of high-tension magneto and hot air intake for carburetor. Note exhaust passing forward, down and back.

Lower—Intake side of same motor showing carburetor mounting and connection of hot air intake. Note detachable cylinder head enclosing overhead valves. Flywheel is ready for gearing to Auto-Lite electrical system which is furnished at \$110 extra on the four-cylinder cars.

construction is that, being readily removable, access to valves and combustion chambers is an easy matter. The valves are carried in the head piece without cages, which allows efficient cooling of both valves and their stems, they being entirely surrounded by water. The plugs are also set at a convenient angle in the head casting on the right side.

A compact and neat appearance is given the engine assembly, due to the housing of the rockers and springs within an aluminum cover plate fitting to the cylinder head and held in place by a bolt at either end. Besides keeping out dirt, this also has the effect of silencing the valve actions. When the cover is in place, only the valve rods running down to the tappets on the right side are visible.

#### Gearbox Mounted Separately

The engine is not of the unit power plant type, but has exposed flywheel with gearbox separately mounted further back. The motor supports are at front and rear of the cylinder casting, and are in the form of arches from which the assembly is hung by bolts. These arched arms attach to the side frame rails.

The carburetor, which is a 1-inch Zenith, double-jet type, is placed on the left side and has a Y-shaped intake. The vaporization of the fuel is augmented by the utilization of heated air taken from a jacket on the exhaust manifold and conveyed through a flexible tube to the air intake. A shelf on the right carries the Simms high-tension magneto which is driven by a shaft connecting to the camshaft drive through helical gearing completely housed at the front of the motor.

On the touring model only, the gasoline tank is placed at the rear of the chassis, and instead of having pressure feed to the carburetor, the Stewart vacuum feed system is employed. The vacuum tank is mounted on the vertical portion of the intake manifold so that its feed to the carburetor is almost vertically downward. On the roadster model, this vacuum supply is not required, as a positive gravity feed is attained by placing the main supply tank on the rear deck, it being high enough above the carburetor to insure a good flow.

Internally, the Chevrolet four-cylinder motor presents no unusual features but adheres to approved design. The crankshaft is a three-bearing type running on die-cast babbit bearings with the center one brass backed. The connecting-rod bearings are also brass backed, and are drop forgings with strap ends. The camshaft is also a three-bearing construction with integral cams, the bearings being of the plain type. This shaft is driven by a helical gear which bolts to its shaft.

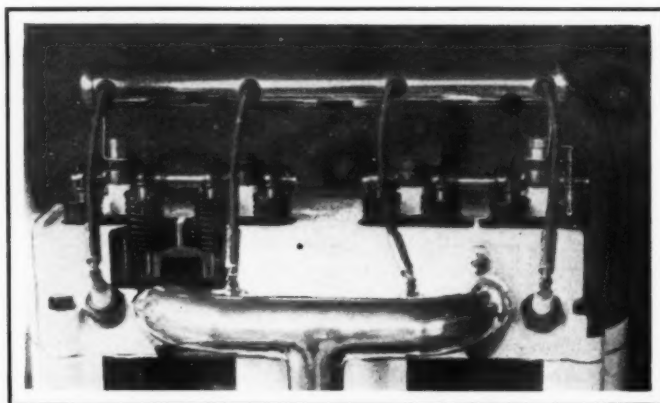
The cooling system is of the thermo-siphon type incorporating the usual belt-driven fan and radiator of large capacity.

The lubrication, ever an important part, is well worked out. The system is a self-contained, constant level splash type with the oil circulated by a gear pump which takes the supply from the lowest part of the crankcase and after forcing it through the dash sight feed, sends it back to a distributing pipe inclosed within the crankcase. This distributor delivers the oil to the individual oil troughs, into which the connecting-rod ends dip at each stroke. All bearings have oil grooves, while the crankshaft bearings are supplied from pockets in the crankcase casting above the bearings. These pockets receive their oil from the splash action. The camshaft bearings are oiled by wicking from the crankshaft bearing pockets.

#### Two-Unit Electrical System

The Auto-Lite cranking and lighting system, which is supplied at extra cost, is of the two-unit type, an electric motor connecting through the Bendix drive with teeth in the flywheel rim serving for turning the crankshaft, and a separate generator driven by helical gearing and carried on the right providing current for lighting and ignition. The latter has in unit with it a Connecticut coil and distributor to take care of the ignition, it replacing the magneto equipment when the electrical system is supplied. The storage battery used is a Willard, while the headlights are of the two-bulb form, eliminating side lamps. The cranking motor, when fitted, occupies a position to the right of the flywheel, being hung from a frame cross arm.

The drive features include a cone clutch of ample proportions. This acts in the flywheel and has leather facing with springs underneath. The cone is of pressed steel and there-



Upper part of Chevrolet four motor, showing overhead valves which are inclosed as illustrated at the upper left of the page.



fore light and strong. The gearset is carried amidships on two frame cross members. It gives three forward speeds and reverse. The main shaft is carried on annular ball bearings while the countershaft revolves on plain bronze bearings. The gearshifting lever is placed directly above, so that an efficient center control is provided.

#### Semi-Floating Rear Axle

The propeller shaft is of the open type fitted with two universals with the torque taken by a torque arm and drive by the leaves of the substantial rear springs. The rear axle is of semi-floating construction with its heat treated shafts running on Hyatt roller bearings. The housing is malleable, and is split crosswise. The gear ratio is 4 to 1. The outer ends of the axle tubes carry the brake shafts operating the internal expanding emergency and external contracting service brakes which act upon 12-inch drums 1 3/4 inches wide.

The rear springs are of three-quarter type and mounted outside of the frame rails. They are 48 inches in length and have scroll rear ends. The front pair are 36 inches long, while all leaves are 1 1/2 in width.

A 17-inch wheel controls the steering gear, which is on the left. This gear is of the worm and worm gear type, adjustable. It incorporates ball thrust bearings to take the thrust load.

The equipment of both roadster and touring car includes everything now looked upon as a standard part of the modern automobile, and is ready for the road.

#### The Six-Cylinder Model

There is very little in common between the chassis design of the six and the fours already described. The motor with its dimensions of 3 5/16 by 5 1/4 delivers 26.3 horsepower by S.A.E. formula, has a displacement of 271.5 cubic inches, and its stroke-bore ratio is 1.58. The cylinders are cast in blocks of three of L-head type, valves being on the right. The crankcase is a two-part, horizontally split design with the cylinder blocks bolting to the upper half of the case.

This engine has the same method of support in the frame as the four, there being arched cross arms from which front and rear of the crankcase are hung by bolts. Arranged on the right side are the exhaust manifold and the three electrical units for ignition, cranking and current generating, crankcase brackets carrying them. The Zenith double jet, horizontal carburetor is placed on the opposite side, there being little or no external intake manifold, connections to the adjacent corners of the cylinder blocks providing entrance to the passages within the castings.

#### Thermo-Syphon Cooling

The cooling is by thermo-syphon in connection with a five-blade, belt-driven fan. Oiling is a constant level splash arrangement with circulation maintained by a plunger pump, operated by a camshaft eccentric. The oil reservoir is an integral part of the lower half of the crankcase, on the right rear side.

Like the four, the main bearings of the crankshaft, which are three in number, and the connecting-rod bearings, are of die cast babbitt brass backed. The camshaft, a drop forging with integral cams, has three plain bearings and is operated by helical gear connection with the crankshaft.

The shaft on the right, which is also driven by helical gears, drives the Auto-Lite generator, and back of it the Remy dual magneto, through universal joint connection. The cranking motor, also an Auto-Lite, is mounted so that its gears will shift into mesh with the flywheel face teeth when the pedal is pressed. This pedal not only makes the gear connection but sends the current to the motor. The storage battery is a 6-volt Willard.

The final drive after it leaves the cone clutch is through a propeller shaft inclosed within a torsion tube. In this con-

struction, only one universal is used, that being ahead of the point where the shaft enters the tube. This tube takes both drive and torque, and is braced by radius rods running from its front end diagonally out to the ends of the axle tubes.

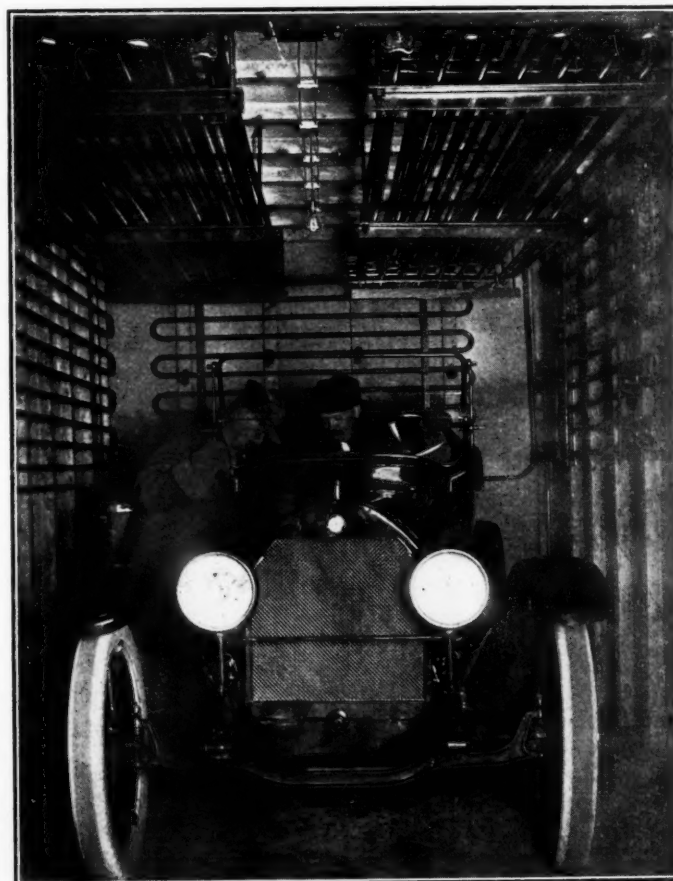
The gearbox is a part of the final drive unit, being interposed between the end of the tube and the axle housing, flanges connecting all three to make a unit. This gearset has three selective speeds and reverse, while the axle is three-quarter floating.

The rear spring suspension departs radically also from that of the four, as it is of the platform type, in which a transverse half-elliptic crass spring shackles at its ends to the rear ends of two other half-elliptics. These parallel the side frame rails, attach to the axle at their centers and shackle to frame brackets at the front ends. The center of the rear cross spring attaches to the frame rear cross member.

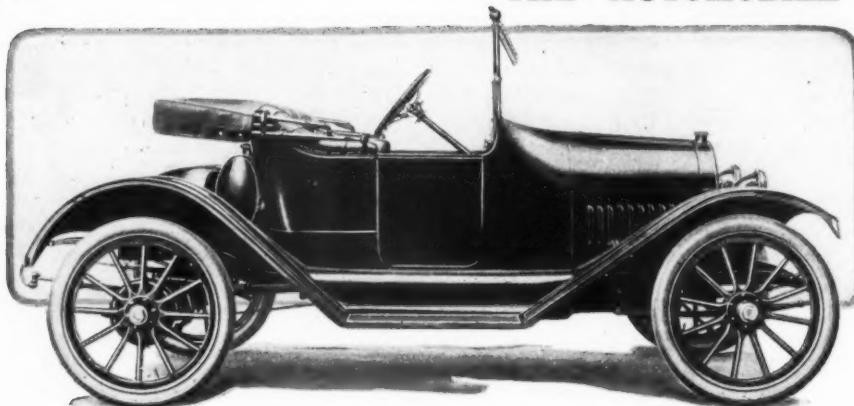
This construction serves as a protection for the 15 1/2-gallon fuel tank hung from the rear of the chassis. Gasoline is fed to the engine under pressure.

Drive is on the left, control in the center and the equipment is complete. Some motor dimensions follow:

Part	Four	Six
Crankshaft:		
Front bearing.....	2 3/4 by 1 1/2	3 by 2 3/16
Center bearing.....	2 by 1 3/16-32	2 5/8 by 2 7/32
Rear bearing.....	3 1/8 by 2	3 3/4 by 2 7/32
Camshaft:		
Front bearing.....	2 9/16 by 1 5/16	2 9/16 by 1 3/4
Center bearing.....	2 by 1 11/16	2 3/8 by 1 11/16
Rear bearing.....	1 7/8 by 1 1/4	2 by 1 1/4
Valve diameter.....	1 1/2	1 1/8
Connecting-rod bearing..	2 1/8 by 1 1/2	2 3/8 by 1 11/16



The Thomas B. Jeffery Co. has recently installed at Kenosha, Wisconsin, a refrigerating plant for the purpose of making cold weather tests on carburetors, batteries and motors. In an hour after starting the refrigerating machinery, it is possible to get a temperature of from 8 to 10 degrees below zero. The room in which this outfit is installed will accommodate the largest models and leaves plenty of room for men to work on the car



New Monroe roadster, which sells for \$460 with equipment

## Monroe Two-Passenger Car \$460, Equipped

Top and Windshield—Electric  
Lights—Unit Power Plant  
Standard Parts Throughout

**A** TWO-PASSENGER 20-horsepower roadster selling for \$460 with complete equipment has been announced by the Monroe Motor Car Co., Flint, Mich. The car is of standard design throughout, has pleasing lines and the equipment includes all the ordinary accessories except a starting motor of Auto-Lite make which is \$35 extra. Two electric headlights and a tail light are fitted, the current being supplied by an Auto-Lite generator and an L.B.A. storage battery. The top is mohair and has a full set of side curtains and a dust cover. A two-piece, double-ventilating rain-vision windshield has been adopted and there is an electric horn, tire pump and tool kit to complete the equipment.

### Thirty Miles per Gallon

Thirty by 3-inch Goodyear clincher tires are used and the wheelbase is 96 inches with standard tread. A speed of from 3 to 50 miles per hour is claimed for this car and the gasoline consumption is stated to be 30 miles per gallon.

The motor is a unit power plant construction suspended at three points. The four cylinders are cast in a block. The valves are in the head which is removable. The bore of the motor is 3 inches and the stroke 3.75, giving an S. A. E. rating of 14.4. Power is transmitted through a 10.5-inch cone clutch to a three-speed selective gearset. The flywheel is exposed and the gearset is connected to the motor by means of two arms which pass around each side of the flywheel.

The electric generator is situated on the right hand side of the motor at the forward end and is driven from the timing gear case by a helical gear. Ignition is supplied by a Connecticut automatic system, the electrical energy being taken from the storage battery. This unit is located directly in front of the lighting generator and is driven by helical gears.

When a starting motor is fitted it is also placed on this side of the motor and drives through teeth which are cut in the rim of the flywheel. The release of the pinion is accomplished by the Bendix helical drive. In this drive the pinion is mounted on a helically cut shaft so that when the starting motor is driving the engine, the pinion tends to slide forward as far as possible and thus holds itself in mesh with the flywheel gear, but when the drive is in the opposite direction the gear slides back out of mesh.

The camshaft is situated on the right side of the motor and operates the valves through a conventional rocker arm construction. The head is held down by seven nuts.

On the right side of the motor is found the Zenith carburetor to which there is a flexible tube connected with a hot air stove on the exhaust pipe. An unusual arrangement is noted in the method of carrying away the exhaust gases. The exhaust pipe is attached to the rear of the casting.

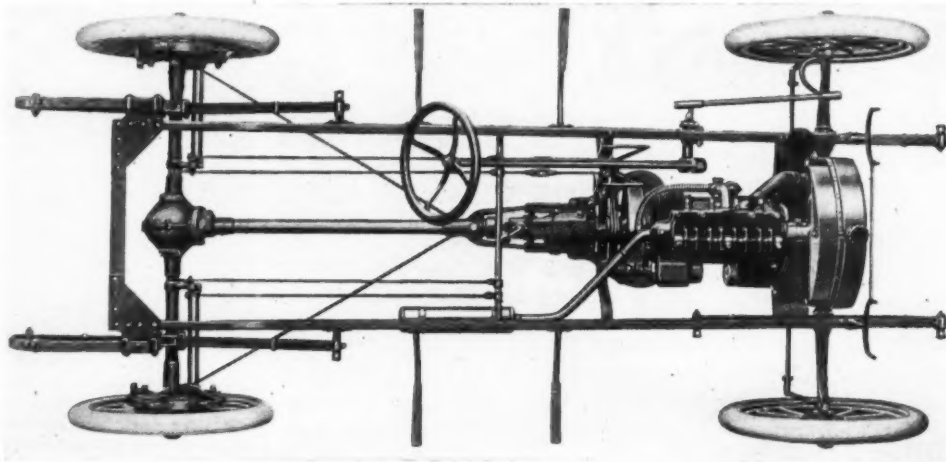
Cooling is by means of the thermosiphon system. A honeycomb radiator with an auxiliary tank at the top is used, the circulation of air through it being aided by a belt-driven fan. The lower connection to the motor is a large diameter hose which enters on the left side near the front, while the return connection to the radiator is at the front end of the motor at the top and in the center.

### Two Main Bearings

The spark plugs are S. A. E. Standard and are situated on the left side and are horizontally placed. The valves are 1.375 inches in diameter. Two main bearings are employed, the front one being 1.5 by 2.5 inches and the rear 1.625, by 2.5 inches. The camshaft bearings are both 1.4375 by 2.75 inches. Helical timing gears are used.

Lubrication is by a pump and splash system, the pump delivering oil to all the rods, bearings and timing gears. The crankcase is provided with a reservoir and there are individual troughs into which the connecting rods dip. The oil level is shown by a float in the breather tube.

Double heat-treated nickel steel gears, carried on ball bearings throughout are found in the gearset. The shifting lever is mounted conveniently at the rear of this unit.



Plan of chassis, showing unit power plant and location of accessories



The rear construction consists of a semi-floating rear axle with a torque tube which is attached to the rear of the gear-set by means of a yoke. This complete unit is reinforced by rods running from the yoke to the axle ends.

A bevel gear reduction of four to one is standard. New departure bearings carry the differential gears and Hyatt roller bearings are used on the axle shaft and main drive shaft. Adjustment of the differential and pinion gear can be made outside of the axle thus obviating the necessity of disassembling the axle.

Internal expanding and external contracting, toggle-operated brakes operating on 10 by 1.25-inch hubs are used. Brakes are lined with Thermoid hydraulic compressed brake lining. The service set is actuated by the clutch pedal and the emergency by another pedal which has a ratchet for locking it.

Half elliptic springs, 36 inches long, are fitted in the front and 3-4 elliptics, measuring 46 inches, are used in the rear. These springs are made from heat-treated steel.

The front axle is an I-beam drop forging with removable bronze bushings in the steering knuckles and ball bearings in the wheels.

A worm and worm gear adjustable steering gear with 16-inch walnut wheel is used with the spark and throttle levers mounted under the wheel. There is also an accelerator pedal.

#### Instruments on Cowl Board

The dimming switch for the headlights, the ignition switch and ammeter are mounted on the cowl board. The upholstery is tufted and it is stated that liberal leg room is afforded. There is a large deck at the rear for carrying baggage. The body is finished in royal blue and metal parts are standard black with nickel trimming.

While this new company is an independent concern it is closely allied with the Chevrolet Motor Co., inasmuch as all stock holders of the Monroe company are also stockholders of the Chevrolet company.

The Monroe company was organized at Flint, Mich., Aug. 1, 1914, with a capital stock of \$250,000, half of which is preferred and half common. The officers of the company are: President, R. S. Monroe; vice-president, W. C. Durant; secretary, Curtis Hathaway; treasurer, Arthur G. Bishop; chief engineer, C. J. Whittacre; consulting engr., John T. Trumbell; purchasing agent, W. C. Rose.

### The Improvement of Spring Suspension

(Continued from page 988)

torsional effect which is of value when only one of two wheels on the same axle is bumped.

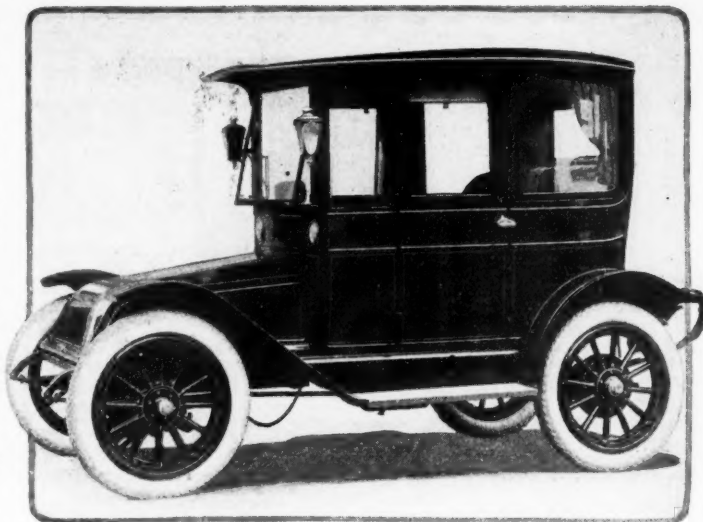
(8) Flexible and elastic vehicle frames; which are often considered undesirable, as they expose bodies and loads to twists and irregular strains and movements.

(9) Seat springs plus upholstering; these are seldom coordinated with the rest of the suspension system.

(10) Spring washers and other anti-vibration devices.

In trying to determine how an equipment composed of some or all of these organs does or does not perform the functions required of it, and how a number of special spring suspensions, to which it will also be necessary to refer in detail, perform similar service, the first thing to be done must of course be to undertake an analysis of the movements to which a vehicle is subject on the road under a number of different representative conditions. In this analysis not only one kind of vehicle must be considered but as many as show essentially different effects, and it is evident that the movement of the body, the load, the running gear must be determined separately and in relation to each other, in so far as possible, and also in relation to the road level and to inequalities in this level, both humps and hollows.

(To be continued)



Ward coupé with five-passenger body which sells for \$2,100

## Ward Has New Coupé and Delivery

Coupé Has Five Passenger Body—Delivery Wagon Sells for \$875—750-Pound Body

THE Ward Motor Vehicle Co., New York City, manufacturer of electric trucks, has entered the pleasure-car field by making a five-passenger electric coupé for 1915. This car is complete in every detail and sells for \$2,100. In addition a 750-pound delivery wagon is announced for \$875. Standard parts are used throughout this car, and it will travel 35 to 45 miles per charge. The other commercial vehicles will be continued practically without change.

The most striking feature of the new coupé is the grouping of all the battery cells in a single compartment at the front of the car. This is covered by a hood, hinged at the rear, which is artistically shaped, its curves blending with those of the body.

Comfort has been aimed at in the design of this machine by adopting a 96-inch wheelbase, large pneumatic tires and coach springs 64 inches long. The upholstery is deep and roomy.

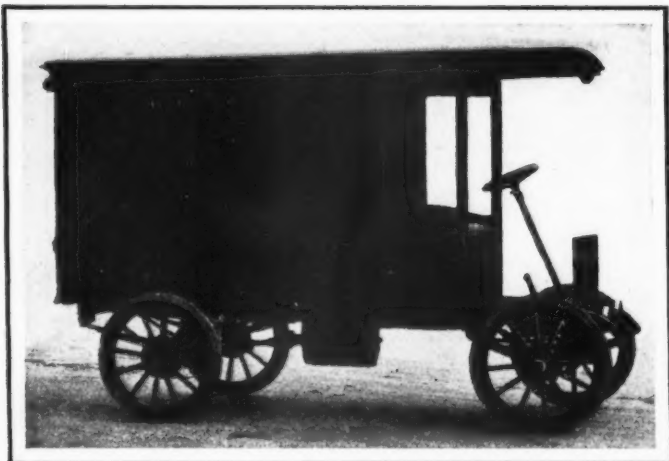
Three passengers are accommodated on the broad rear seat while two more are provided for on individual swivel seats in front. This allows the passenger sitting next to the driver to face forward, or to the rear, as desired.

The interior is upholstered in blue broadcloth to match the body finish. The curtains are of blue silk. The interior equipment includes a silver-mounted flower vase, toilet case watch, memorandum book, and perfume bottles.

#### Drive on Left

The car is driven from the left side, the horizontal controller being operated with the left hand. There is an electric bell or horn button conveniently placed in the end of the handle. The steering handle, just above the controller lever, is worked with the right hand. There are two sets of expanding foot brakes, either set can be applied and either is sufficiently powerful for perfect control although both can be used if desired.

The master switch is in front of the operator and immediately below the windshield. Three sets of electric light but-



Ward Special light delivery wagon which retails for \$875

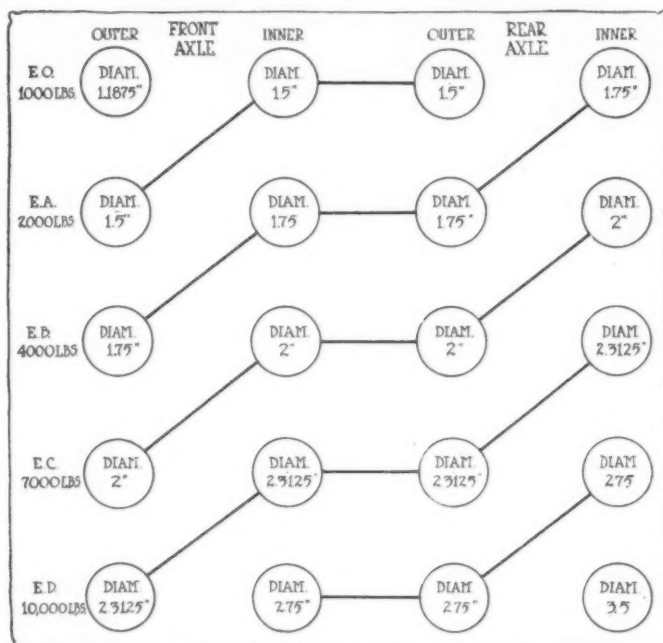


Diagram showing relation between bearings sizes used on five different Ward models. The lines connecting the different circles show the bearings of one size. There are only seven sizes in all

tons arranged on the left just beyond the steering handle, control the lights including a rear lamp and reading lamps.

The battery is a lead cell type made by the company. It has 40 cells of 15 plates each. This gives a mileage radius of from 60 to 100 miles depending on road conditions. The speed varies from 17 to 20 miles per hour. Five forward speeds are provided and there are two reverse.

Power is produced by a 3.5-horsepower General Electric series-parallel motor located amidships. The drive is transmitted through a single pair of bevel gears to a floating axle of Timken make. The front axle is also made by Timken. The springs are alloy steel, heat-treated and 64 inches in length. Wood wheels of the artillery type are fitted and the tires are 34 by 4.5 inches all around. Demountable rims and Brown puncture-proof inner tubes are used.

The regular equipment includes seven lamps, two side

lamps, two reading lamps, two standing lamps and one rear lamp, an electric bell or horn; speedometer; locks for doors and control box, hydrometer, thermometer, pump, complete kit of tools and jack.

#### Ward Special Costs \$20 a Month

The Ward Special, which is the name of the delivery car, has been brought out especially to compete with horse-drawn wagons of this type. The Ward company claims that this machine may be stored, washed and charged for \$20 per month while a horse and wagon will cost \$30.

The driver sits on the left side and steers through a wheel. The control levers are all within easy reach and controller switches are accessibly located under the driver's feet.

A Westinghouse motor is used. It is suspended from the center of the chassis and connects with the rear axle through two universals. Timken axles are fitted both front and rear. From 35 to 45 miles can be obtained from a single charge and the speed varies from 10 to 12 miles per hour.

Wooden wheels and 32 by 2.5-inch solid tires are equipped all around. A single set of expanding brakes act on the rear wheel drums.

The standard finish is a Brewster green body, light green belt panel, and running gear of the same color. The equipment includes storm curtain, lamps, bell, thermometer, plug, cable, hydrometer, and complete kit of tools.

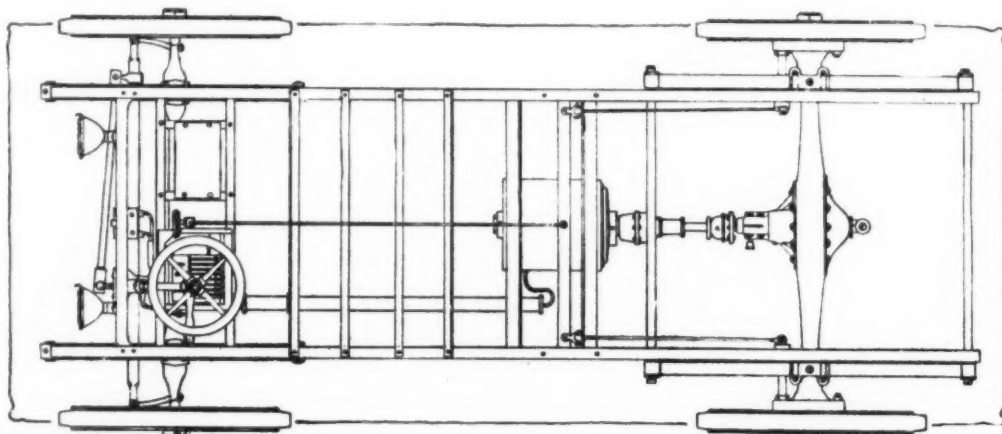
On the five other models there have been no changes of note except in the capacity ratings which are now as follows, the respective prices also being given: 1,000 pounds, \$1,250; 2,000 pounds \$1,500; 4,000 pounds, \$1,900; 7,000 pounds, \$2,450; 10,000 pounds, \$2,950.

#### Wheel Parts Standardized

An interesting feature which is a step towards standardization is noted in the dimensions of wheels, tires, and wheel bearings on these five models. The sizes of wheels and tires progress from the smallest to the largest model so that the total number of sizes is reduced to six instead of having ten as would otherwise be necessary. The rear wheel of one truck is used as the front wheel of the next one and the rear wheel of this truck is used as the front wheel of the following larger size, etc.

This principle is further illustrated in the accompanying figure which shows the bearing sizes for the different models. First looking at the inner bearing on the front wheel spindle of the 1,000-pound truck it will be noted that this becomes the outer bearing on the front axle of the 2,000-pound truck. Likewise, the same diameter of bearing is used for the outer bearing on the rear axle of the 1,000-pound truck. This results in seven bearing sizes instead of twenty.

This scheme of construction not only saves in first cost but where a man has a fleet of trucks of different sizes the stock of repair parts that it is necessary for him to carry is greatly reduced.



Chassis plan of Ward Special, showing motor mounted in the center



# Detroit S. A. E. Compares Eight with Six

Attendance of Many Chief Engineers Indicates Intense Interest in Subject—Weight and Balance Much Discussed

**D**ETROIT, MICH., Nov. 23—A discussion of the eight versus the six-cylinder motor held the attention of the Detroit Section of the Society of Automobile Engineers at its meeting on Nov. 20. The attendance and the number of chief engineers present indicates that there is no question but that this is at present the leading topic of design in the automobile industry at the moment.

Opening the discussion was a review by T. P. Chase, chief engineer of the King Motor Car Co., of the considerations which led his company to adopt the eight-cylinder motor instead of the six-cylinder type for coming year. Beside the increase in torque over the four-cylinder design, and the high-speed possibilities of the eight, the King company has been able to place the new motor in the present chassis and under the present sized hood.

## Comparison of Weights

A change to a six-cylinder design of the same power as its present motor would have necessitated either a cramping of the body room or the lengthening of the wheelbase. A 90-degree V-type motor is to be used and it is to have practically the same piston displacement as the present model.

Mr. Chase made some interesting comparisons as to the approximate weights of the various parts in the two motors. In the new motor, the cylinders are cast in two blocks, of four cylinders each, and from the rough castings it is estimated that these two blocks, together, weigh about 28 pounds more than the single block of the present four-cylinder motor. Other comparisons indicate that the eight connecting-rods weigh but little more than the four old rods; crankshaft bearings are of practically the same size, and therefore, of the same weight; and the flywheel, of course, does not have to be as heavy as on the four, due to the increased number of explosions per revolution. In these two motors, of practically the same piston displacement, it is estimated by Mr. Chase that the eight-cylinder job, complete, will not weigh over 35 pounds more than the present four-cylinder motor.

It is possible to make the connecting-rods each considerably lighter than those of the four-cylinder motor, due to the fact that they have to withstand a smaller total pressure, since the areas of the pistons are less. The same applies to the bearings.

In relation to sizes and weights, Wm. B. Stout, chief engineer of the Scripps-Booth Co., stated the law governing areas and volumes. By this law areas increase or decrease by two dimensions, while volumes may vary in three dimensions. If a mass is made on-half the size of another mass, the surface will be one-fourth as great as the latter, and the weight one-eighth as great. Mr. Stout cited the aeroplane as an example of this. With a machine half the size of another the wing area per unit of weight will be twice as great.

Considering the weight and area relations of high-speed motor-car engines, the above law also holds within the limitations of construction. These limitations mean that in foundry practice a piston wall can be cast only just so thin and, therefore, it is often impossible to make the parts as light as would be theoretically possible. If a piston for one motor was of the correct weight, the theory would show that another piston of half the dimensions would have one-fourth the working area, and one-eighth the volume.

## Light Reciprocating Parts

Even with the practical limitations of construction, a motor with the same stroke as another but with half the bore will give better high-speed results than the other, due to the greatly reduced weight of the reciprocating parts, and the resulting decrease in vibration, together with the greater possibilities in revolutions per minute. The newer 3 by 6-inch high-speed motors certainly show a decided improvement over the older 6 by 6-inch square motors. Mr. Stout stated that passenger comfort depended not so much upon the impulses per revolution as upon the number of revolutions per mile. Since the eight-cylinder motor will be primarily a high-speed

motor, and also give more explosions per revolution than the four or six, the increase in the impulses per mile will be very marked.

## In Favor of Six

For the six-cylinder side, the case was presented by J. G. Vincent, chief engineer of the Packard, Allen Loomis, also of the Packard, and S. I. Fekete of the Hudson. Mr. Loomis drew numerous diagrams upon the blackboard in explanation of the balance of the inertia forces. He showed that due to the angularity of the connecting-rod the inertia curve is not a true harmonic motion, and for this reason the inertia forces do not exactly balance in the four-cylinder motor when the cranks are in the horizontal and vertical planes. With the cranks in the vertical plane the unbalanced portions tend to lift the four-cylinder motor, and when in the horizontal plane there is a downward thrust. These unbalanced forces tend to cause the four-cylinder motor to vibrate up and down.

## Questions of Balance

The new eight-cylinder motors have the cylinders inclined to each other at 90 degrees, or in other words, their center lines are inclined 45 degrees from the vertical plane through the crankshaft. The unbalanced inertia forces in each block of four cylinders are, of course, the same as in the case of a four-cylinder motor, and act along the center lines of the cylinder. Since these center lines lie in planes inclined 45 degrees from the vertical, the inertia forces may be resolved into vertical and horizontal components. Because of the relations between the piston movements in the two sides of the motor, the vertical components of these forces cancel each other, and there is no tendency for the motor to vibrate up and down. The horizontal forces, however, add to each other, and during part of a revolution their direction is to one side of the motor, while later it is to the other side. These horizontal forces, therefore, mean that there is a tendency for the motor to vibrate sideways.

## Vibration Tendencies

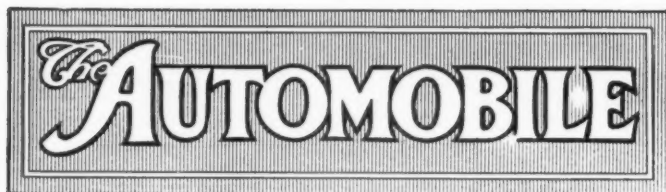
In the six-cylinder motor a plotting of the inertia forces shows that the resulting reaction on the engine base is equal to zero. There is, therefore, no tendency to vibrate in the six-cylinder motor, due to unbalanced inertia forces.

Another solution, showing the tendency of four and eight-cylinder motors to vibrate, was presented by Mr. Fekete. This speaker considered the center of gravity of the total system of pistons and connecting-rods. He stated, that due to the angularity of the connecting-rods the center of gravity in a four-cylinder motor would vary up and down as much as 5-8 of an inch. Plotting this movement for the eight-cylinder motor the variations for the two sets of cylinders would, in some cases, add to each other so that the total variation might easily be as great, in some cases, as 3-4 inch. In a properly designed six-cylinder motor, Mr. Fekete said that the center of gravity of the piston and connecting-rod systems did not move.

## Preventing Crankshaft Whipping

Although the theoretical discussion showed the inertia forces in the six-cylinder motor to be in perfect balance, the point was brought up as to the difficulties in six-cylinder design in preventing the whipping of the long crankshaft. In the eight-cylinder V-motor the crankshaft need be no longer than in a four-cylinder motor, and therefore, the vibration and other difficulties arising from the springing and whipping of the crankshaft may be more easily overcome than in the case of the six.

Speaking of the relation of the ignition problems to the eight-cylinder engine, A. de Marigny, of the Mea company, thought that battery ignition would not be suitable for these new type engines, due to the great speed which would be required of the coil. He believed that a magneto would be required for the best service.



PUBLISHED WEEKLY

Vol. XXXI

Thursday, November 26, 1914

No. 22

## THE CLASS JOURNAL COMPANY

Horace M. Swetland, President  
 W. I. Ralph, Vice-President E. M. Corey, Treasurer  
 231-241 West 39th Street, New York City

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United States and Mexico ----- One Year, \$3.00  
 Other Countries in Postal Union, including Canada ----- One Year, 5.00  
 To Subscribers—Do not send money by ordinary mail. Remit by Draft,  
 Post-Office or Express Money Order, or Register your letter.

Entered at New York, N. Y., as second-class matter.  
 Member of the Audit Bureau of Circulations.  
 The Automobile is a consolidation of The Automobile (monthly) and the Motor  
 Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903,  
 and the Automobile Magazine (monthly), July, 1907.

## The New Fuel

**A**LTHOUGH the new fuel may be manufactured in quantities at 2 cents per gallon as reported and sold in quantities at 6 cents per gallon; and although it has demonstrated its practical value in a 1000-mile speedway test, it must not be assumed that it has taken a place side by side with gasoline, with the possibility of ousting the older fuel from the field in a few years. The promoters of the fuel may have no such thought in mind, rather they apparently have a new fuel which offers particularly attractive manufacturing and merchandising qualities, and its entry into the field cannot be looked upon with anything else but a spirit of welcome, as any new fuel that will tend towards lower existing prices will be gladly received.

The fuel will face greatest competition when it comes to the question of manufacture for general distribution and then will follow the greater problem of national distribution. The distribution of any motor fuel must be as general as that of the sale of sugar or any other household staple. Gasoline is really becoming more so by the wide extension of the curb-side station, which during the past year was so extended as to make it unprofitable for many garages to sell it. The new fuel has to meet these conditions.

Merchandising motor fuels is one of the expen-

sive factors in connection with them. For several years we have seen our big refineries buy the crude, pump it a thousand miles or more to the refinery, refine it, load it into railroad tank wagons and ship it to substations, and there load it into tank motors and deliver to garages and private users for 10 cents per gallon or under. While this was being done many garages were selling it for 20 cents and some for 25 cents per gallon, yet these garages had nothing to do but install a storage tank with pump and pump it into the tank of the automobile. Look on the one hand what the manufacturers did for 10 cents and then what the middle man did for the same amount.

Viewed in the light of merchandising conditions the new fuel has its battles to win. It is sincerely hoped that it may develop into a fuel forming a worthy rival of gasoline, and further that if it attains such prominence, that, then, may come some economies in merchandising which will make it possible for the car owner to profit by reduced cost of manufacture rather than losing all of such advantages due to the merchandising of it through a middle man at an unreasonable profit.

## Rational Fire Regulations

**T**HE recent activity of the fire-marshall department in New York State, in which a new code of regulations governing the construction of new garages and modifications to be made in old ones was promulgated, suggests how essential it is for automobile manufacturers and dealers to take due recognition of the abuses that are certain to invade any industry and to take measures to correct these before too great activity is launched from other sources.

Every new industry has its abuses, and it cannot be denied that there are many garages in New York State and in nearly every other state in the Union that violate all rational regulations. On the other hand the majority of the new garages are exemplary structures, practically on a par with the moving picture theatre in obedience to fire regulations. With the revamped livery stable as an example of the fire trap in the garage field, it at once becomes imperative on those with modern buildings to take up the burden of getting a higher standard in the dangerous buildings.

It cannot be gainsaid that there are dangers connected with the general use and storage of gasoline in a garage or repairshop, but if we hedge the storing and handling of the gasoline around with good safety precautions there is not any reason why we should go to the opposite extreme and introduce unnecessary legislation, once we have really eliminated the danger factor of the garage.

It is absurd to draft any laws prohibiting the use of an open torch in a repair shop, and requiring that the torch can only be used in a separate room with a door opening only to the outer air. It is generally equally absurd to require the same regulations governing heating boilers, etc. What is needed is sane legislation.



# To Revise Fire Regulations for Garages

**New York Trade Association Shows Injustice of Enforcing Present Rules—Another Hearing Before State Marshal December 9  
—Saxon Brings Out Five-Passenger Six**

**A**LBANY, N. Y., Nov. 18—The regulations governing changes in structure of garages and repair-shops recently promulgated through the state of New York by Thomas J. Ahearn, state fire marshal, and which regulations were to take effect December 1, have been temporarily held up, due to a conference in the state capitol today at which the Automobile Trade Assn. of New York showed why the present regulations are unjust, inconsistent and in many cases would work very serious injury to existing garages in the state. As a result of today's conference the existing regulations will not go into effect December 1 and it is probable that they will not be enforced at all in their present manner.

## Another Hearing December 9

On December 9 there will be another hearing before the state marshal at the capitol here when the officers of the State Dealers' Assn. will meet with the state fire marshal to revise the present code. It is expected that in this revision a great many of the articles will be changed and that the enforcement will not follow until requisite time. In the meantime the state marshal is notifying all of his deputies throughout the state that the code as promulgated will not be enforced December 9 and matters will remain as they are until a revision is accomplished.

At today's hearing president R. H. Johnston, of New York City, and head of the State Dealers' Assn., read letters from Rochester dealers showing how the Rochester fire marshal had notified them that their garages were violating the new code and that alterations must be made before December 1. Practically every garage in Rochester had received notification covering improvements on the ceilings of the garages, requiring metal lath and three-quarters inch of plaster; also notifying them that the repair-shop must be separated by a fireproof wall with automatic fire doors from the garage proper; also that staircases and elevators must be enclosed in fireproof partitions with automatic fire doors; also that metal window frames and sashes with wire glass must be changed, etc., etc.

It was shown that one dealer would have to make an expenditure of \$6,000 on his garage in order to conform with the new requirements, and that these changes could not be made inside of 8 weeks, although only 2 weeks were given in which the work was to be done and if not completed at the end of that time action would be taken towards closing the garage according to the regulations.

This danger has now been overcome and the probabilities are that the final draft of garage regulations will be entirely rational and not work a foolish hardship on any garageman with the exception, perhaps, of those who have located in one-time livery stables which have not been brought up to rational fireproofing standards.

## Many Unfeasible Rules

Today's hearing demonstrated conclusively that there are many unfeasible rules in the existing regulations. One is that a torch cannot be used in a repair-shop, the idea of the regulations being that there would have to be a separate fireproof room in one corner of the repair-shop. The torch, forge, etc. would have to be used in this fireproof room and this room would not have a door into the repair-shop but only one leading into the outer air. It was shown that this was impossible in many existing modern garages built in entire accordance with the existing fire laws previous to the recent code which the state fire marshal had circulated. If there is to be a fire door between the repair-shop and the garage, and if gasoline is not permitted in the repair-shop, then there is no reason why the open torch or the forge should not be permitted without restrictions in the repair-shop.

Then if the revision takes place it is certain that there will be a new classification of garages instead of the promulgated one.

Charles Thaddeus Terry in arguing the case for the New

York dealers, drew attention to the general lack of feasibility existing throughout the new draft. He attacked the basis of garage classification on the ground that it was unfair and irrational. He cited one case where an existing garage has a cement floor 2 3-4 inches thick but according to the promulgated regulations this should be 3 inches thick and that it would be impossible to lay an additional 1-4 inch and have a satisfactory floor.

The regulation requiring that heating boilers be located in a room with an entrance only leading to the outside air was shown to be impracticable in many existing fireproof garages.

The New York State Dealers' Assn. is going to get from all of its dealers an expression of opinion on the various garage questions and will go to the next hearing on December 9 in possession of all this information so that the outcome should be a code of garage and repair-shop regulations that are sane and enforceable.

## Saxon Brings Out 5-Passenger Streamline Six

**DETROIT, MICH., Nov. 20**—The Saxon Motor Co. has had a new car on the road in the vicinity of the city for the past 6 months which will be shown at the New York show. It is a six-cylinder type of five-passenger body design, with stream lines and sloping hood.

In bringing out this new model, the production of the small four-cylinder roadster at \$395 will not in any way be curtailed. In fact, the success which this car has attained since the concern was started about a year ago has prompted the arranging for greatly increased output of the four for the coming year.

Present factory facilities have become inadequate and plans have been completed for utilizing parts of factories near the present plants on Bellevue avenue. The overflow quarters are on Beaufait avenue, and they give to the Saxon company triple the factory space it formerly occupied.

## General Electric To Make Starters

**NEW YORK CITY, Nov. 21**—A new electric starter is about to be placed on the market by the General Electric Co. of Schenectady, N. Y., Lynn, Mass., Windsor, Conn., and Fort Wayne, Ind. The first effort of this giant concern will be the production of a starter for Ford cars to market at \$87.50. It will be a single-unit design made under the trade name G. E.

The selling end of the business will be handled through the A. J. Picard company of this city which has signed a 3-year contract. This concern has been taking care of the Gray and Davis interests in New York and has been closely in touch with the industry, through its president A. J. Picard, for several years.

## Welfare Men Want Truck Drivers Examined

**YORK, PA., Nov. 21**—At the second annual conference of the Industrial Welfare and Efficiency Conference held in this city for 3 days last week and at which the welfare of workmen and workwomen in factories was the subject of much discussion, the adoption of an act requiring all drivers of motor vehicles to take an examination before an examining board was favored by several of the delegates. The examining board would issue a certificate and it was hoped by this means that accidents would be reduced.

**SYRACUSE, N. Y., Nov. 23**—The Brown Co., of Syracuse, N. Y., announces that it has purchased the rights, plans and good will of the Lewis-Sanford Pump Works, Boston, Mass. This concern has manufactured several types of pumps, the latest of the line being the one-cylinder pump of original ideas and adaptable to Ford and several other makes of cars.

# France Buys 900 More Trucks

600 of 2-Ton and 300 of  
5-Ton Type Bring Total U. S.  
Sales to France to 2,640

NEW YORK CITY, Nov. 23—The French government which some 6 weeks ago purchased 1,740 motor trucks from four American companies, namely, White, Packard, Pierce-Arrow, and Kelly-Springfield, made another purchase last week from White and Pierce-Arrow. Both orders were practically a duplicate of the previous ones, the White order being for 600 of their 2-ton models. The Pierce order is for 300 of the 5-ton trucks. This last order makes a grand total of 2,640 American trucks sold to date to the French government as the result of the present war.

Word comes from Detroit that the Standard Motor Truck Co., that city, has received an order for 100 trucks, some 3-tons and other 5-tons. These have been sold to the British government.

## Special Work for Big English Firms

LONDON, Nov. 10—There is little if any change in regard to the condition of touring car manufacturers in England, many of them being out of action indefinitely, to use a military phrase. Fortunately some of the larger concerns that were well equipped with automatic machinery have been able to undertake the production of special work for the war department, which will continue until the end of the war.

## Government Buys Chassis

The completed chassis which the majority of the English companies had on hand when the war broke out have been disposed of to the government, many being fitted with armored bodies for scouting work. The Red Cross has absorbed a great many of these. As an indication of government orders there is the case of the Vulcan Motor Co., which has obtained an order for vehicles and parts to the amount of \$1,000,000 during the past month, which will keep the factories busy for some time. The war business in the commercial vehicle end has greatly helped conditions and the leading factories now operating for the government are producing approximately seventy chassis per week. Firms not engaged on orders for the British government are working on others for the Belgians and Russians. Only last week the Austin Motor Co., secured a Russian order amounting to \$1,250,000, with an additional order for parts valued at \$250,000.

This order called for forty-eight armored cars, each carrying two machine guns and five men and with a maximum speed of 40 miles per hour; eighteen automobile work shops equipped with lathes, drills, etc., sixteen tank wagons for transporting gasoline; eight spare-parts wagons equipped as traveling stores; 128 ambulances for twelve stretchers each; and 100 transport wagons of the 3-ton type. In addition there was a large equipment of accessories such as jacks, lighting sets, extra tires, spare parts, etc.

There is much enterprise being shown here by several American makers of trucks. The Peerless company, which had some trucks accompanying the Canadian contingent is here demonstrating. The Jeffery quad or four-wheel-drive, is making an impression on the war authorities, the Standard of Detroit is being demonstrated, as is the Fremont-Mais, as well as several others. It was reported here that the Woolesey company, one of the largest makers of gasoline trucks in England, has secured the agency for the full line of Baker electrics in this country.

## Shortage of Horses

The shortage of horses is becoming a critical factor in England, and already the government has special buying agents through all the South American countries. This condition is bound to have an effect on the motor vehicle industry in the near future.

Conjecture has it in and around the war office in London that should the war be prolonged over another year or longer, there will not be much slackening in the demand for commercial vehicles for field service. Britain's army will be much larger next spring, and at present the Russian army is being handicapped by lack of trucks. Lord Kitchener is at present training an army of 1,000,000 men in different parts

of the British Isles. These are to take the field in the spring and their presence in the war zone will call for a great increase in motor equipment. It has just been reported that the Australian government has voted \$1,000,000 for motor equipment to accompany its expeditionary force which is now being prepared.

Many other reports are current in London regarding truck sales, one being that Whittings, Ltd., has secured an order from the Russian government for fifty American Federal trucks.

The present winter has already greatly hampered the use of trucks in Russia, Eastern Prussia and Austria. Non-skid tires are receiving much attention, and now many of the armored cars are being fitted with a tire known as the K.T., which, instead of being a continuous band of rubber, is made up of rubber studs placed very closely together. Another device extensively used is the Parsons non-skid chain as well as the Never-Skid device. It has recently been learned that the German government in June had placed a very large order with the English company for Parsons chains, the order to be delivered on telegraph demands. These demands came at the time the war broke out and deliveries were not made.

## Many Steam Wagons

An interesting aspect of motor transportation in the war is the great number of steam wagons collected from users throughout England. These wagons were largely used in the milling industry and are giving a good account of themselves in the hauling of heavy guns in the war zone. They have been fitted with specially wide tires, making it possible for them to be used in soft fields.

## Metzger Sues United States Motor Directors

NEW YORK CITY, Nov. 20—Emanuel Metzger, a minority stockholder in the old United States Motor Co., which was succeeded by the present Maxwell Motor Co., has filed a suit in the Supreme Court for New York county, asking that the directors of the old company account for assets which he alleges were wasted during the months prior to the receivership. Metzger attempted to intervene in the receivership.

## Automobile Securities Quotations

NEW YORK CITY, Nov. 24—During the past week there was a market for automobile securities on the curb, but not a very active one. The following quotations are those which a prominent brokerage house finds to obtain in private sales and are not to be taken as official. However, they will serve as a guide until the re-opening of the Stock Exchange.

	1913		1914	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com.	200	215	150	..
Ajax-Grieb Rubber Co., pfd.	96	102	100	..
Aluminum Castings, pfd.	98	101	..	..
Chalmers Motor Co., com.	95	98	..	93½
Chalmers Motor Co., pfd.	..	97	..	97
Firestone Tire & Rubber Co., com.	250	255	..	..
Firestone Tire & Rubber Co., pfd.	103	104	..	..
Garford Co., pfd.	80	90	..	..
General Motors Co., com.	36	35	66	68
General Motors Co., pfd.	74	76	82½	84
B. F. Goodrich Co., com.	18	19½	20	21
B. F. Goodrich Co., pfd.	80	83	87	..
Goodyear Tire & Rubber Co., com.	225	230	175	185
Goodyear Tire & Rubber Co., pfd.	96	97½	..	..
Gray & Davis, Inc., pfd.	96	102	..	..
International Motor Co., com.	..	5	..	..
International Motor Co., pfd.	..	15	..	..
Kelly-Springfield Tire Co., com.	..	..	60	63
Kelly-Springfield Tire Co., 1st pfd.	..	..	75	80
Kelly-Springfield Tire Co., 2nd pfd.	..	..	92	96
Lozier Motor Co., com.	10	16	..	..
Lozier Motor Co., pfd.	..	92	..	..
Maxwell Motor Co., com.	2¼	2¾	14½	15
Maxwell Motor Co., 1st pfd.	18	20	43	45
Maxwell Motor Co., 2nd pfd.	5½	6½	17½	18½
Miller Rubber Co.	120	130	..	..
Packard Motor Car Co., com.	..	..	..	100
Packard Motor Car Co., pfd.	90	94	89	..
Peerless Motor Car Co., com.	15	25	..	..
Peerless Motor Car Co., pfd.	75	85	..	..
Pope Mfg. Co., com.	1	3	..	..
Pope Mfg. Co., pfd.	10	20	..	..
Portage Rubber Co., com.	..	35	..	..
Portage Rubber Co., pfd.	..	90	..	..
Reo Motor Truck Co.	6	7½	10½	11½
Reo Motor Car Co.	15	16½	21½	22½
Stewart-Warner Spd. Corp., com.	55	60	46½	47½
Stewart-Warner Spd. Corp., pfd.	94	97	92	98
Studebaker Corp., com.	16	17½	27	..
Studebaker Corp., pfd.	66½	69	..	81
Swinehart Tire & Rubber Co.	78	80	..	..
U. S. Rubber Co., com.	53½	54½	43	44½
U. S. Rubber Co., pfd.	99¾	100	95	97
White Co., pfd.	104	110	..	..
Willys-Overland Co., com.	64	68	70	72
Willys-Overland Co., pfd.	84	90	85	90



proceedings in the federal court in New York a year or so ago but was ruled out by the court.

As individual defendants he names James C. Brady, Benjamin Briscoe, Frank Briscoe, Richard Irvin, Herbert Lloyd, Johnathan D. Maxwell, Eugene Meyer, Jr., Edgar J. Meyer, Ora J. Mulford, Henry W. Nuckols, Richard A. Robertson, Kenneth B. Schley, Charles G. Stoddard, James W. Stoddard, Carl Tucker and the company itself.

Another echo of the receivership was heard in the United States district court in New York last week when Harold A. and John C. Howard, trustees of the estate of Sarah J. Howard, secured permission to sue the old Maxwell-Briscoe Motor Co. They demand the balance on a lease on the company's Chicago branch, the lease running until 1929 and payments having ceased in the summer of 1913.

The assets of the United States Motor Co. were sold by the receivers with the permission of the court and were in turn sold to the present Maxwell corporation. The receivers have not yet been discharged and the United States Motor Corp. and its subsidiaries still exist in form at least. Under a ruling of the court, claimants were required to appear before a certain date or be stopped from collecting, and it was this ruling which had to be modified before the Howards could sue on their lease. Should they recover they may collect under an arrangement made by the court when the Maxwell Motor Co. bought the assets.

### Haynes Asks Retrial of Agent Suit

KOKOMO, IND., Nov. 21—The Haynes Automobile Co. has asked for a retrial of the suit brought against it by Benjamin H. Goodman, Omaha, Neb., whose dealership contract, signed at the factory in the afternoon, was rescinded in favor of one given in the forenoon in Omaha to C. F. Louk. The Goodman contract was given by sales manager Richard Bacon and the Louk contract by S. H. How, a field representative of the Haynes company. After long litigation and an appeal from the United States district court to the Court of Appeals, Goodman recently secured a verdict of \$3,250.

Manufacturers state that such a condition could not now arise because of a contract clause which requires the approval of some high factory official before any contract be-

comes binding. But in 1909 this apparently was not the case with the Haynes company.

Goodman's story is that during the afternoon of September 1, 1909, he contracted at the factory in Kokomo for twenty-five Haynes cars and gave two checks totaling \$1,250 as deposit. At 11 o'clock that morning the traveling representative in Omaha had signed up Louk; both contracts were for an exclusive agency. As soon as the Haynes company discovered the duplication it returned Goodman's deposit September 8, with an explanation that the Louk contract, made several hours earlier, must stand.

His deposit checks had been cashed by the company, however, and the return was by a Haynes check, which Goodman also cashed. When he went to the factory again to insist that the contract be carried out he tendered \$1,250 in cash as a deposit. The offer was declined.

He sued for \$25,000, in the United States district court for Indiana and Haynes won. On appeal Goodman secured a new trial; on the new trial a jury gave him \$3,250, November 12, 1914. The reasons given by Haynes in its motion for a new trial are that the verdict is not substantiated by sufficient evidence, is contrary to law, is contrary to evidence and is too large.

### Piel Charges Infringement of Long Patent

NEW YORK CITY, Nov. 23—Gottfried Piel and the G. Piel Co. filed suit yesterday in the United States district court against the Stewart Warner Speedometer Corp., charging infringement of the Long hand horn patent, No. 1,090,080. It is charged that the Stewart Warner Signal, recently brought out, infringes the Long patent in its diaphragm and adjustable wear piece. The suit is directed against the manufacturing company, a Virginia corporation, and the New York branch, a New York corporation.

### C. of C. Special Meeting December 3

NEW YORK CITY, Nov. 23—A special meeting of all the members of the National Automobile Chamber of Commerce has been called by President Clifton for Thursday, December 3, at 11 a. m., at which time the attention of the entire chamber will be drawn to the present litigation of the Kardo company on floating axle construction and other patents. It is expected that the national chamber may consider the advisability of defending suits brought against its members by the Kardo company.

### Prompt Shipment of Crude Rubber

NEW YORK CITY, Nov. 20—Arrangements are being made for operation of steamers, carrying the Holland flag, from Sumatra and Java direct to the United States, in order to enable consumers of crude rubber in this country to get their supplies of plantation grades more promptly. According to plans now under consideration the first vessel will sail from the Far East on December 20.

The cruiser Emden, which was recently sunk after a career in which she destroyed many merchant vessels, was the cause of some worry to the rubber trade of the United States, and there was general relief at the news of the Emden's destruction. That vessel, it is said, probably cost the rubber industry in America \$1,000,000, and had she been allowed to continue to roam the Indian Ocean indefinitely she would have cost the American industry still more.

Before she was sunk, the vessel destroyed two dozen merchant ships, carrying 3,900 tons of crude rubber.

### Overland Car Shipments Increase 4,194

NEW YORK CITY, Nov. 23—The Willys-Overland Co., Toledo, O., shipped 15,207 cars up to November 6, as against 11,013 for the same period in 1913. The shipment for the first 6 days of November was 1,135, as against 803 last year. The total shipment of 1914 cars was 45,003. The output for 1915 will be 75,000.

### Chicago Stock Exchange Resumes Trading

CHICAGO, ILL., Nov. 23—The Chicago Stock Exchange opened its doors today and trading resumed where it stopped July 30, when with other trading centers the Exchange closed because of the European war.

That the stock exchange in New York City is quite certain to reopen for limited business before the end of the month, was the substance of the assurances received from responsible banking and brokerage authorities. On Nov. 24, the Governors of the Stock Exchange will meet for the purpose of deciding the question of resuming business in bonds.

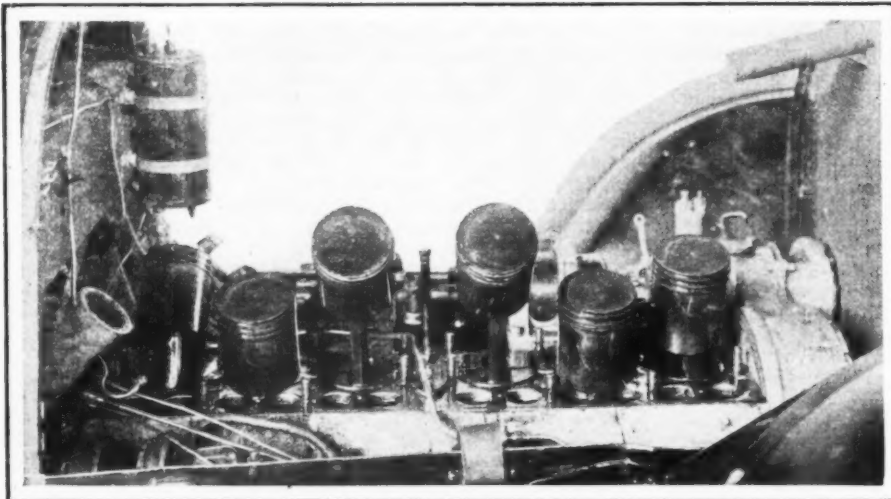
### Market Reports for the Week

Changes in the market reports this week were few. These few were increases, occurring in the copper, tin and cottonseed oil markets. Electrolytic and Lake coppers saw a slight gain for the week with business quiet, although a firmer tone prevailed in sympathy with the further rise at London. Tin went up \$1.63 per 100 pounds, in sympathy with the further sharp rise at London due partially to the unfavorable reports in the Far East affecting the safe transportation of tin from the Straits to Europe. Cottonseed oil rose \$0.18 per barrel. However, the tone is unsettled and the consuming demand not what it was a week ago, being then very strong. The local market for crude rubber lacked new features of importance last week. Inquiries continue light, consumers being disposed to go slowly in the matter of replenishing supplies pending new developments in the situation.

Lead rose \$0.20 per 100 pounds, closing at \$3.90. This product was quiet but firm at the closing. The rest of the markets remained at the same prices quoted last week. In the metals markets, antimony was quiet at \$0.13 1-2, the other markets remaining steady. All of the oils and lubricants continued steady. A moderate demand was reported for petroleum. Linseed oil was firm with trading more active.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Antimony	.13 1/2	.13 1/2	.13 1/2	.13 1/2	.13 1/2	.....
Beams & Channels, 100 lbs.	1.21	1.21	1.21	1.21	1.21	.....
Bessemer Steel, ton	18.50	18.50	18.50	18.50	18.50	.....
Copper, Elec., lb.	.119 1/10	.12 1/4	.12 1/4	.12 3/4	.12 3/4	+ .007 1/2
Copper, Lake, lb.	.12 1/10	.12 1/4	.12 1/4	.12 3/4	.12 3/4	+ .001 1/4
Cottonseed Oil, bbl.	5.40	5.41	5.40	5.51	5.58	+ .18
Cyanide Potash, lb.	.25	.25	.25	.25	.25	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.....
Gasoline, Auto, bbl.	.13	.13	.13	.13	.13	.....
Lard Oil, prime	.90	.90	.90	.90	.90	.....
Lead, 100 lbs.	3.70	3.90	3.90	3.90	3.90	+ .20
Linseed Oil	.47	.47	.47	.47	.47	.....
Open-Hearth Steel, ton	18.50	18.50	18.50	18.50	18.50	.....
Petroleum, bbl., Kans., crude	.55	.55	.55	.55	.55	.....
Petroleum, bbl., Pa., crude	1.45	1.45	1.45	1.45	1.45	.....
Rapeseed Oil, refined	.71	.71	.71	.71	.71	.....
Rubber, Fine Up-River, Para	.67	.67	.67	.67	.67	.....
Silk, raw, Ital.	4.00	4.00	4.00	4.00	4.00	.....
Silk, raw, Japan	3.13	3.13	3.13	3.13	3.13	.....
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	32.00	32.10	32.75	32.75	33.63	+ 1.63
Tire Scrap	.05	.05	.05	.05	.05	.....

# Marmon Goes 1,000 Miles on New Fuel



Marmon 41 motor taken down after running 1,000 miles on the new fuel

INDIANAPOLIS, IND., Nov. 20—To demonstrate that a new motor fuel which it is claimed can be manufactured for 2 cents per gallon, and marketed at 6 cents per gallon in large quantities, is a practical fuel for motor car use, an official 1,000-mile test was made on the speedway here yesterday and today with the Marmon 41 touring car, covering 500 miles each day.

The new fuel was employed throughout the test in which the 1,000 miles were covered at an average of 50.2 miles per hour. Throughout the test only one apparently serious trouble was encountered at the end of the first 100 miles when it was discovered that the fuel was apparently frozen in the vacuum tank where it enters the carburetor. It was necessary to clean the pipe out, a 40-minute stop being required. This trouble was explained as being due to failure to strain the fuel before putting it in the car. With this single exception the fuel gave apparently satisfactory results although the consumption was rather high, averaging 7.42 miles per gallon. The weather was not satisfactory to a test of this nature, being very cold, the temperature during the first day ranging from 10 to 20 degrees Fahr. and on the second day being as low as 6 degrees at the start but rising to 25 when the trials were finished late in the afternoon.

The new fuel used showed a hydrometer reading of 55 Baumé as compared with 58 Baumé for gasoline. This 55 reading was at 40 degrees Fahr. and at 28 degrees Fahr. the reading was 53 Baumé. This fuel, as described in THE AUTOMOBILE, July 9, is made from a number of secret chemicals with water and naphthalene also used. Naphthalene is a substance from which moth balls are made and it is because of this that this fuel has been so closely associated with moth balls in the minds of many people. The fuel is said to have a moth ball odor.

The test showed that speeds, that compared favorably with those made by using gasoline, were obtained. The Marmon 41 used in the trials was the same car that a week ago averaged 62.89 miles in 1 hour with top and windshield up and carrying five passengers. In the new fuel test the car carried but the driver and mechanic and had the windshield up but the top down. With this equipment it averaged 55.25 miles per hour during the last 100 miles of the test. Its other average for 100 mile periods ranged between 49.45 and 54.80, the average for the entire distance being 50.2.

After the test was over the motor was dismantled in order to note the

carbon deposits that had collected. In this examination the cylinders were taken off and the valves removed. The official report made by F. E. Edwards, technical representative of the contest board of A. A. A., states that "the metal parts of the engine are remarkably clean, showing very little more deposits than were found in this same engine at the completion of its 1-hour trial on November 12. No deterioration of metal parts due to chemical action was to be observed with the eye."

The fastest lap in the 2-day trial was second to the last, which averaged 62.85 miles per hour, a speed practically equivalent to that which the car averaged with gasoline in its hour test on November 12.

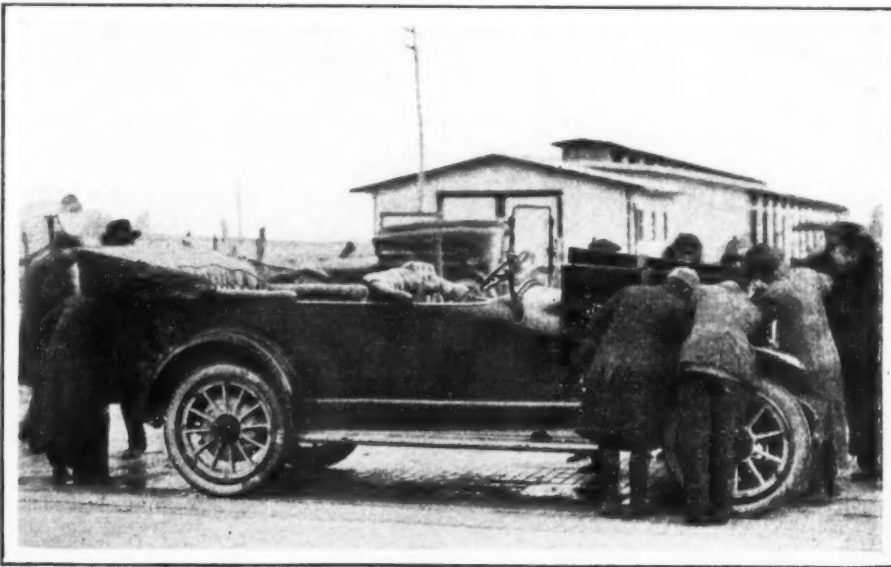
When the total lost time of 1 hour and 56 minutes is taken out, the average speed is brought up to 55.95 miles per hour.

The trials were timed by a new electric timer, the invention of Chester Ricker, the speedway engineer.

INDIANAPOLIS, IND., Nov. 23—Plans for a trip to the Panama-Pacific exposition to be held in California next year have been outlined to the Hoosier Motor Club. Division No. 1 would leave Indianapolis June 1 and require about 60 days for the trip. Division No. 2 would leave about July 1 and would require 30 days. The third division which would be a special train, would leave July 26.

## Actual Running Time

MILES	TIME			AVERAGE M.P.H.
	HRS.	MIN.	SEC.	
100.....	1	54	50.8	52.3
200.....	3	57	37.0	50.6
300.....	6	01	26.3	49.95
400.....	7	49	27.4	49.45
500.....	9	34	30.8	52.45
600.....	11	19	47.5	53.00
700.....	12	53	53.4	54.40
800.....	14	45	44.9	54.25
900.....	16	27	27.3	54.80
1000.....	18	06	49.3	55.25
Total time				
lost.....	1	56	07.0	



Technical committee examining the car before the runs made in the 1,000-mile test of new fuel in a Marmon 41





Scene at Indianapolis Motor Speedway during 1,000-mile trial of new fuel in Marmon 41. Note supplies, tires, etc., at side of track

## Twenty-One Entries for Corona Road Race

### Practice Starts for 301-Mile Contest

CORONA, CAL., Nov. 19—Twenty-one entries have been received for the Corona road race to take place on the Grand boulevard, Thanksgiving Day.

The purse is \$12,000 and the \$5,000 Flagler trophy.

The length of the course is 2.76895 miles. The race is 109 laps or a total of 301.81 miles.

Practice started on the course November 17.

CAR	DRIVER	ENTRANT
Peugeot	Burman	Peugeot Import Co.
Peugeot	Rickenbacher	Peugeot Import Co.
Sunbeam	Grant	Harry Grant.
Sunbeam	Babcock	Harry Grant.
Duesenberg	Alley	E. L. Duesenberg.
Duesenberg	O'Donnell	E. L. Duesenberg.
Duesenberg	Callaghan	E. L. Duesenberg.
Stutz	Cooper	Not named.
Stutz	Klein	Walter M. Brown.
Stutz	Not named	Walter M. Brown.
Mercer	Pullen	Simplex-Mercer Co.
Mercer	Nikrent	Simplex-Mercer Co.
Mercer	Ruckstall	Simplex-Mercer Co.
Marmon	D'Alene	Wilbur D'Alene.
Marmon	Cadwell	A. A. Cadwell.
Maxwell	Carlson	Maxwell Motor Co.
Maxwell	Not named	Maxwell Motor Co.
Mercedes	De Palma	Ralph De Palma.
King	Ball	Eagle Motor Co.
Gordon Special	Gordon	Tom Gordon.
Bergdoll Special	Bergdoll	Louis Bergdoll.

### Nineteen More Exhibitors for Big Shows

NEW YORK CITY, Nov. 23—Seven makers of electric passenger cars, two makers of gasoline passenger pleasure cars,

and ten accessory exhibitors have been added to the already long list for the national automobile shows in New York and Chicago. Following are the electric: American Electric Car Co., Saginaw, Mich.; Anderson Electric Car Co., Detroit, Mich.; Baker Motor Vehicle Co., Cleveland, O.; Ohio Electric Car Co., Toledo, O.; Rauch & Lang Carriage Co., Cleveland, O.; Waverley Co., Indianapolis, Ind., and Woods Motor Vehicle Co., Chicago, Ill. All of these makers will exhibit at both shows, except the American Electric Car Co., and the Woods Motor Vehicle Co., which will be only at the Chicago exhibition.

The added gasoline car makers are: Chevrolet Motor Co., New York City, and Trumbull Motor Car Co., Bridgeport, Conn.

The ten new accessory exhibitors are as follows: Chicago and New York Charter Single Sleeve Motor Co., Chicago, Ill.; Gray Bros. & Co., Chicago, Ill.; Lipman Air Appliance Co., Beloit, Wis.; Mathisen Spring Cushion Wheel Co., Chicago, Ill.; A. J. Picard & Co., New York City; Positive Supply Co., Davenport, Ia.; Wm. Shakespeare, Jr., Co., Kalamazoo, Mich. At New York only will be: Eclipse Machine Co., Elmira, N. Y.; W. S. Sheppard, Newark, N. J.; K. G. Welding & Cutting Co., New York City.

### Cut Down Space at Quaker Show

PHILADELPHIA, PA., Nov. 21—Owing to inability to secure adequate quarters to accommodate all the would-be exhibitors at the forthcoming automobile show of the Philadelphia Automobile Trade Assn., that organization has been compelled to adopt a plan restricting the amount of space to be allotted. In order to secure a representation of the greatest number, any member handling but one make of car will be limited to 400 square feet of exhibition space. An additional 200 square feet will be optional to those handling two or more makes.

Drawings for space will take place at a meeting of the Trade Assn. to be held next Tuesday.

## Vanderbilt and Grand Prize Course Practically Completed

SAN FRANCISCO, CAL., Nov. 20.—W. L. Hughson, chairman of the Vanderbilt and Grand Prize racing committee, states that the course on which the big races are to be run in February is practically completed and some fast laps have been made to show the possibilities of the 4-mile lap. The entire course has been changed from a gravel road to an asphalt surface.

The course is 4 miles around and ranges in width from 40 to 70 feet. There are two right-angle turns and at each of these the road is 70 feet wide. There are two half turns, two gradual curves and one hairpin. The race will be spectacular from almost any point on the course. The grandstand will accommodate 25,000 people.



## Dissension in N. Y. State Association

### Rochester and Buffalo Clubs May Join Syracuse—Drop Forge Association Formed

POUGHKEEPSIE, N. Y., Nov. 19—There may be formed in New York State an independent organization as an aftermath of the proceedings at the annual convention of the New York State Automobile Assn. which closed here tonight. The convention, which began yesterday, was the scene of a faction fight between the present association organization, headed by President A. J. Deer, Hornell, and the Rochester and Buffalo clubs, which endeavored to prevent Deer being chosen for a fourth term and also attempted to have the by-laws amended. They were steam-rolled in all their moves, and the larger part of the two big club delegations left before the convention ended.

The fight was for and against Deer. The Rochester and Buffalo clubs charge that he is operating *Motorism*, the official organ, as a profit-paying enterprise. Deer replied that, while he owns 398 shares in the publication, he is willing to turn it over to the association as soon as it is free and clear from an indebtedness of \$15,000. Deer had secured and voted twenty-three proxies from the smaller clubs of the State, and this proxy question was another source of difference. One of the amendments proposed by Rochester and Buffalo was that a proxy must be held by a resident member of the club represented. It failed to pass.

So strong has been the opposition of the two big clubs to the conduct of Deer and his organization that they had not paid dues up to the hour the convention opened: at that time Buffalo paid dues for 3,002 members and Rochester for 2,861, thus giving their delegates standing. After having been steam-rolled, however, they stated that there was a strong possibility that Rochester, Buffalo and Syracuse would form an independent organization—Deer termed it a "progressive party"—and ask recognition from the A. A. A. If formed, it would have about 10,000 members and would be about equal in strength to the regular organization. The matter is to be taken up at the next meeting of the respective clubs. Syracuse pulled out about 2 years ago.

Highway Commissioner John N. Carlisle injected an element of surprise when he suggested that there be a reciprocal arrangement between New York, New Jersey, Massachusetts and Connecticut whereby foreign tourists pay a tax of 4 cents a gallon on gasoline for good roads maintenance. Sanitary Supervisor Paul V. Winslow, of Wappingers Falls, suggested that the association co-operate with the State in sanitary work about hotels and other public places.

General Counsel Melvin Bender reported on bills which had been throttled during the year and urged the passage of a wheel tax. The convention named a committee to take up long detours because of closed roads. Leaving half the road passable was urged.

The association now has seventy-five clubs, a gain of thirteen, and 17,516 members, a gain of 2,995.

### American Drop Forge Assn. Formed

DETROIT, MICH., Nov. 20—Factory superintendents and shop men from American and Canadian drop forge manufacturing concerns met here yesterday and formally organized the American Drop Forge Assn.

A preliminary meeting was held several weeks ago with this organization in view and the officers then suggested were elected at yesterday's meeting. These officers are: R. R. Ellis, superintendent Detroit Forging Co., Detroit, Mich., president; George Des Autels, manager Anderson Forge & Machine Co., Detroit, Mich., vice-president; A. E. Dibble, manager Frost Gear & Forge Co., Jackson, Mich., secretary; E. B. Horne, superintendent Packard Motor Car Co., Detroit, Mich., treasurer.

An executive committee was then named consisting of the following men: E. Ingalls, Ingalls-Shepard Forging Co., Harvey, Ill.; M. Henry, Henry & Allen, Auburn, N. Y.; C. A. Prochler, Canton, O.; R. Herdegen, Dominion Stamping Co., Walkerville, Ont., and E. B. Horne, of the Packard Motor Car Co., Detroit.

"The object of this organization," said Vice-president Des Autels,

"is to bring the factory and shop men in the drop forge industry together. It must not be misconstrued that the manufacturers have organized. As a matter of fact we managers and superintendents have not asked the manufacturers what they thought about the idea and we took steps among ourselves because we found it advisable that we should get better acquainted as to matters concerning the shops. We want to better conditions for the shop men, we desire to discuss our mutual methods and improve them, to get together from time to time at meetings similar to those of the society of automobile engineers, and especially, to promote better efficiency among the men."

### History and Progress at E. V. A. A. Session

NEW YORK CITY, Nov. 23—Things which were serious in the early days but which cause smiles now were described by Robert McAllister Lloyd last week at a meeting of the New York section of the Electric Vehicle Assn. of America; he talked on The Influence of the Pioneer Spirit on Electric Vehicle Progress. Lloyd is a consulting engineer and one of the old-timers in the electric vehicle field.

He said the first impulse given the industry was by the battery makers who sought a new market for their products; the second motive was the public craze for the electric when \$70,000,000 of capital was put into the industry, only to suffer loss by collapse; then came the "dark ages"; the next impulse was given by the electric light companies which, too, sought an extended market for their current. Pioneering, he said, was over by 1908.

### Lozier Company Fights Insolvency Charge

DETROIT, MICH., Nov. 24—*Special Telegram*—U. S. District Judge Tuttle yesterday granted permission to three creditors of the Lozier Motor Co., to amend their petition to the Court to include the charge of bankruptcy because the company is unable to pay its debts.

At a meeting of directors of the company a special committee consisting of J. M. Gilbert and E. D. Stair, of Detroit, and E. P. Earl, New York City, was appointed to confer with Eastern creditors holding claims for about \$1,000,000 to further discuss plans for reorganization and legally avoid, if possible, having the company being declared bankrupt on the grounds that the company is unable to pay its debts. The hearing of the creditors has been set by the court for December 1.

### Overland's Connecticut Dealers Hold Convention

HARTFORD, CONN., Nov. 23—Thirty sub-agents of the Overland-Connecticut Co., which has all of the state of Connecticut with the exception of Fairfield county, met at the Hartford headquarters Friday for a business convention. Addresses were made by general manager C. W. Hine and sales manager Carney of the Hartford office and by H. B. Harper, factory sales manager, R. L. Lockwood, special factory representative, I. F. Maxson, district factory representative and J. R. Wallace, factory mechanical representative. All the new Overlands were on display in the local salesrooms. Several of the sub-agents drove away with new cars to be used as demonstrators in their respective districts.

### A Many-Named New Spark Plug

NEW YORK CITY, Nov. 23—Over 3,800 names for a new spark plug were received by the Emil Grossman Mfg. Co. in its contest for a name for its new plug. R. F. Darby, 30 Church street, New York, and in the employ of the American Steel Foundries, suggested the winning name, Onepiece, which the judges today selected as the most appropriate one, in that the plug is really a one piece construction, as the insulation is cemented by baking process into the shell, giving a plug without gaskets, etc. In all over 2,200 letters were received in reply to the advertisements of the contest placed exclusively in the Class Journal publications, THE AUTOMOBILE, Motor Age and Motor World.

### Raise Ferry Rates on Automobiles

PHILADELPHIA, PA., Nov. 20—Automobilists are now compelled to pay an increase in ferriage rates on the Pennsylvania Railroad ferries between Philadelphia and Camden. This went into effect on November 17. The new rate for automobiles is 25 cents, which entitles four persons to ride in the car, and for each additional passenger riding in the machine ferry ticket sellers will collect an additional 3 cents. Under the old rate a flat charge of 25 cents was collected for each automobile carried between the two cities.



# Factory Miscellany

**MILLER Rubber Adds**—The Miller Rubber Co., Akron, O., has let contracts for the erection of a two-story, 120 by 128-foot brick fireproof building, which will increase the present capacity to over 1,000 tires a day. Recently the company bought the plant adjoining its property, which was owned by the Franz Body Works. This will be partly rebuilt and used as a shipping department, while temporarily it serves as a garage, until the 60 by 100-foot garage is completed. At the rear of the plant a three-story, 40 by 110-foot warehouse is being built, while an extension to the rubber drying-room, 50 by 110 feet, is in course of construction. To take care of the additional factory space, which will total 272,905 square feet, or about 6 1-2 acres, a 2,000-horsepower plant is being installed. Complete extensions are expected to be finished by January 1.

**Standard Tire's \$25,000 Addition**—Standard Tire & Rubber Mfg. Co., Wiloughby, O., will build a steel factory addition at a cost of \$25,000.

**DeLion Tire Building in Trenton**—The DeLion Tire & Rubber Co. Trenton, N. J., has started the construction of a large plant for the manufacture of its specialties.

**Portable Garage Factory Planned**—The Mower Portable Automobile Garage Co., Seattle, Wash., is planning to erect a factory for the manufacture of portable garages.

**Hercules Tire's Plant**—The Hercules Tire Co., Oakland, Cal., plans to construct a plant at Long Beach, Cal., for the manufacture of automobile tires. The plant will turn out about 190,000 tires annually.

**Kelsey Wheel to Add**—The Kelsey Wheel Co., Memphis, Tenn., will enlarge its plant to permit the manufacture of entire wheel frames for automobiles in-

stead of spokes only, as heretofore; estimated reported cost \$100,000.

**Fifty Men Added to Gramm Plant**—Fifty men will be added to the Gramm motor plant at Lima, O., which follows the announcement that the company has decided to increase the capacity of the plant and only turn out 1,350-pound trucks.

**Apple Plant at Waverley**—The Apple Electric Co., whose plant was formerly in Dayton, O., has completed the shipment of its machinery from that plant to its new factory in Waverley, N. J. The Dayton plant hereafter will be used only as a service and distributing station.

**Bartlett to Establish Factory**—Reginald Bartlett of Toronto, Ont., president of the Bartlett Automobile Co., has signed an agreement with Stratford, Ont., to establish an automobile factory there. The company is capitalized at \$1,000,000. It will manufacture a medium-priced automobile.

**Singer Co. Settled in Factory**—The Singer Motor Co. is settled in the new factory in Long Island City. At the present time the company is turning out five cars a week, and by the first of the year will be increased to fifteen. There is also a complete service station where overhauling and painting are done.

**Fisher Body Enlarging**—A further enlargement of the Fisher Body Co., Detroit, Mich., is taking place. A six-story steel and concrete addition 80 by 112 feet is in course of construction and will cost \$40,000, while to the present five-story building another story will be added, the enlarged plant to be 280 by 112 feet.

**Motokart Plant in Scranton**—Scranton is to have another industry. The plant of the Motokart Co., Peekskill, N. Y., is to be moved from that city to Green Ridge street, Scranton. The board

of trade in the latter city will erect the building, which will cost about \$60,000. The machinery of the company is valued at over \$100,000. At present the company employs 200 hands, but within a year it may employ 1,000 hands.

**Vaughan Plant to Be Marketed**—J. P. Day has been appointed exclusive sales agent of the Vaughan Motor Car Co. one-story brick plant at Kingston, N. Y., which recently was remodeled by the Vaughan company. The property is located on the main line of the West Shore Railroad, sidings from which run into the plant. It is also equipped with a modern power plant having a 250-horsepower Corliss engine driving dynamos of 75 and 90 kilowatt.

**Crawford's Spring Co. About Ready**—The new automobile spring company in Lansing, Mich., will probably be formally announced in the near future, the \$100,000 necessary for its organization having been very nearly subscribed for by local business interests. The inventor of the spring is W. H. Crawford, who has secured basic patent rights. The name of the company will probably be Crawford No-Shock Spring Suspension Co.

**Milwaukee Westinghouse Plant Working**—The Westinghouse Lamp Co., of New York, a subsidiary of the Westinghouse Electric Co., has commenced operations in its new western plant at Milwaukee, Wis., purchased some months ago from the Kissel Motor Car Co. of Hartford, Wis., upon the abandonment of the Kissel company's Milwaukee factory. The new Westinghouse plant will have an output of 600,000 Mazda lamps monthly, and it is said a considerable share of these will be low-voltage lamps for motor car purposes. The plant consists of five large buildings and is located on the main line of the C. M. & St. P. Rv. Co. at Thirty-first and Center streets, Milwaukee.

## The Automobile Calendar

Nov. 26.....Corona, Cal., Road Race, Corona Auto Assn.  
Nov. 26.....Harrisburg, Pa., Economy Run, Harrisburg Motor Club.  
Dec. 1-4.....New York City, Annual Meeting of the American Society of Mechanical Engineers.  
Dec. 12-19.....Akron, O., Show, Akron Auto Show Co., O'Neill Bldg.  
Dec. 14-18.....Chicago, Ill., American Good Roads Congress.  
Jan. 2-9.....New York City, Annual Automobile Show, Grand Central Palace.  
Jan. 2-9.....New York City, Automobile Salon, Grand Ball Room of Astor Hotel, Automobile Importers' Alliance, E. Lascaris, Pres.  
Jan. 3-10.....Buenos-Aires, Argentina, Grand Prize of Argentina.  
Jan. 9-16.....Philadelphia Show, Metropolitan Bldg., Philadelphia Auto. Trade Assn.  
Jan. 16.....Detroit, Mich., Show.  
Jan. 16-23.....Cleveland, O., Show, Cleveland Automobile Show Co., F. H. Caley, Mgr.

Jan. 23-30.....Chicago, Ill., Automobile Show, First Regiment Armory.  
Jan. 23-30.....Montreal, Que., Show, Allen Line Liverpool Bldgs., Montreal Automobile Trade Assn., T. C. Kirby, Mgr.  
Jan. 30-Feb. 6.....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Automobile Trade Assn.  
Feb.....Portland, Ore., Show, Portland Auto. Trade Assn.  
Feb.....Toledo, O., Show, Toledo Auto Show Co.  
Feb. 15.....Grand Rapids, Mich., Show, Klingman Furniture Exposition Bldg., Grand Rapids Herald, C. S. Meriman.  
Feb. 15-20.....Omaha, Neb., Show, Auditorium, C. G. Powell.  
Feb. 22.....San Francisco, Cal., Vanderbilt Cup Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.  
Feb. 23-27.....Ft. Dodge, Ia., Show, Armory, C. W. Tremain, Sec.

Feb. 23-27.....Syracuse, N. Y., Show, Syracuse Auto Dealers' Assn.; H. T. Gardner, Mgr.  
Feb. 27.....San Francisco, Cal., Panama-Pacific Exposition, Grand Prize Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.  
Mar. 6-13.....Boston, Mass., Show, Mechanics Bldg., Boston Auto Dealers Assn., Boston Commercial Motor Veh. Assn.  
Mar. 9-15.....Des Moines, Ia., Show, C. G. Van Vliet.  
Mar. 14.....San Francisco, Cal., Panama-Pacific Cup Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.  
April.....Calumet, Mich., Show, Coliseum.  
May 29.....Indianapolis, Ind., 500-Mile Race, Indianapolis Motor Speedway.  
Sept. 20-25.....San Francisco, Cal., International Engineering Congress.

# The Week in the Industry



## Motor Men in New Roles

**COZZENS Joins Four Wheel Drive**—Fred. H. Cozzens, formerly of the International Motors Co., New York, and the Peerless Motor Car Co., Cleveland, O., has been made Eastern and foreign sales manager of the Four Wheel Drive Co., Clintonville, Wis. He will have charge of truck sales in the territory east of Pittsburgh and north of Wilmington, N. C., and in addition will look after the foreign business of the company.

**House Manager**—G. A. House has been appointed manager of sales of the Auto Wheel Co., Lansing, Mich.

**Greenwald Firestone Branch Manager**—Lemon Greenwald of Ashland, O., has been made manager of a branch of the Firestone Tire and Rubber Co. to be opened at Santiago, Porto Rico.

**Smith Blair Truck Manager**—Charles Smith, formerly manager of the Newark Lumber Co., Newark, O., has resigned his position to become general manager of the Blair Auto Truck Co., Newark.

**Knowles Milburn Assistant Manager**—R. W. Knowles has been appointed assistant engineer of the electric vehicle department of the Milburn Wagon Co., Toledo, O.

**Weaver Resigns**—H. G. Weaver has resigned his position as publicity manager of the Haynes Automobile Co., Kokomo, Ind., to become sales manager of the Newell Motor Car Co., St. Louis, Mo.

**Moore Saxon Sales Manager**—Lawrence Moore, formerly in charge of the foreign sales department of the Saxon Motor Co., Detroit, Mich., has been made manager of sales both foreign and domestic.

**Paxson Joins Regal**—C. K. Paxson has been appointed a special representative of the Regal Motor Car Co., Detroit, Mich. Formerly he was general sales manager of the Ohio Motor Car Co., Cincinnati, O.

**Shettler Resigns**—Leon T. Shettler has discontinued his connection with the Grant company at Los Angeles, Cal., distributor and has joined the Earl C. Anthony organization, which has the agency for the Packard in southern California.

**Blethen Heads Seattle Club**—At the annual meeting of the Automobile Club of Seattle the following officers were elected: Joseph Blethen, president; W. A. Avery, treasurer; R. L. Sparger, vice-president, and F. M. Fretwell, secretary.

**Jack Russell Chief Engineer**—R. F.

Jack has been appointed chief engineer of the Russell Motor Car Co., Ltd., Toronto, Ont. Mr. Jack comes from the Cadillac Motor Car Co., Detroit, where he was assistant chief engineer of that company.

**McCune Kissel Manager**—The Kissel-Kar Co. is the name of a new concern which has been organized with C. G. McCune as general manager to handle the Kissel-Kar in central Ohio. The sales agency is located at 241 North Fourth street, Columbus, O.

**Dalton Studebaker Assistant Branch Manager**—F. N. Dalton has been appointed assistant branch manager for the Studebaker Corp. in Los Angeles, Cal. Mr. Dalton was called to Los Angeles from Salt Lake City.

**Hinkle Heads Tire Co.**—A reorganization of the Livingston-Hinkle Rubber Co., 186 East Gay street, Columbus, O., has been made by the retirement of G. E. Livingston. The entire concern will be operated by H. L. Hinkle under the name of the Hinkle Tire & Rubber Co.

**Lansdale Krit Sales Manager**—H. L. Lansdale, who was sales manager of the Krit Motor Car Co., Detroit, Mich., has been appointed general manager, replacing H. H. Crawford, who has resigned and who had the position since the Krit company was reorganized the latter part of 1913.

**Jamison Resigns**—C. F. Jamison has resigned his position as sales manager for the Saxon Motor Co., Detroit, Mich., to enter business for himself. Mr. Jamison long has been a member of the firm of Jamison Bros., Lafayette, Ind., implement and hardware dealers. It is understood that the firm will continue to handle automobiles.

**Marshall Inter-State Representative**—W. L. Marshall, formerly the Xenia agent for the Studebaker has become factory representative for the Inter-State factory, Muncie, Ind., and will cover ten counties in southwestern Ohio. The new distributing firm will be located at Dayton and will be known as the Twyman Motor Car Co., Dayton.

**J. M. Studebaker Injured**—J. M. Studebaker, Sr., of the Studebaker Corp., South Bend, Ind., was painfully injured November 19 in an automobile accident. The car in which he was riding and another car crashed together in a blinding snowstorm. Mr. Studebaker is 81 years old, but his injuries are not regarded as serious.

**McDuffie Joins Los Angeles Firm**—Joseph H. McDuffie, one of the pioneers of the automobile business in the United

States, has become associated with the W. R. Ruess Co., Los Angeles, Cal., in the capacity of general manager. Mr. McDuffie is well known, as at one time he was connected with the McDuffie Automobile Co., Chicago, and until recently he was Western representative of the F. B. Stearns Co.

**Myers Heads Baltimore Dealers**—E. R. Myers, of the Motor Car Co., Baltimore, Md., was elected president of the Baltimore Automobile Dealers' Assn. at the annual meeting which was held November 11. He succeeds F. S. Bliven of the Standard Motor Co. The other officers elected were: G. B. Hall, of the Auto Outing Co., vice-president in the place of A. S. Zell, of the Zell Motor Car Co.; R. J. W. Hamill, of the Mar-Del Mobile Co., secretary-treasurer in the place of E. R. Myers. On the board of directors G. B. Hall was elected to take the place of Walter Scott.

## Garage and Dealers' Field

**Foreign Agent to Add American Cars**—Watson & Co., 164 Broadway, Madras, India, at present importers and general distributors of motor cars and accessories, shortly will take the agency for an American car.

**Electric Mfg. Opens St. Louis Branch**—The American Electric Car Co. opened a branch house in St. Louis, Mo., recently, at 5029 Delmar boulevard, with Louis Goodhart as manager. The branch will be incorporated as the American Electric Car Sales Co.

**Hartford May Be Motorized**—If the recommendations made this week to the Mayor in the annual report of the Board of Public Safety are carried out, all horse-drawn vehicles in the police and fire departments of Hartford, Conn., will be displaced by motor cars as soon as the city's finances permit.

**Large Garage in Centralia**—St. John & Titus, Centralia, Wash., automobile and accessory dealers, are adding a concrete addition to their garage, 26 by 130 feet. This will be used for a tire and supply department and also for a showroom. A floor space of 12,000 square feet will be had with the enlargement.

**Maxwell to Have Women Demonstrators**—As a measure to increase the number of Maxwell sales to women customers the Maxwell Motor Co., Detroit, Mich., is to make a nation-wide canvass of all women's organizations for the purpose of engaging women demonstrators. It is stated that they will be paid at the same rate as the men already employed.

## Recent Incorporations in the Automobile Field

### New York

**ROCHESTER**—United Taxi & Delivery Co.; capital, \$4,000. Incorporators: Julian B. Lewis, 23 Herman street; William Mayerson, 27 Gilmore street; Morris M. Dollits, 16 Herman street.

**YONKERS**—Morris Place Garage Co.; capital, \$500; to operate a garage. Incorporators: Harry J. Haussler, William H. Haussler and William Haussler, all of 45 Post street.

### Ohio

**AKRON**—Superior Tire & Rubber Co.; capital, \$25,000; to manufacture tires, etc. Incorporators: George S. Andrus, H. E. Andrus, C. G. Wise, W. E. Young and R. I. Moore.

**WILLOUGHBY**—Standard Tire & Rubber Mfg. Co.; capital, \$100,000; to manufacture tires and mechanical goods. Incorporators: Charles E. Shaw, C. F. Groth, E. A. Williams, J. W. Smith and J. A. Smith.

### Tennessee

**MEMPHIS**—Bender's Garage; capital, \$2,500. Incorporators: D. A. Fisher, C. N. Bender, L. G. Bender, L. T. Kavanaugh and I. W. Crabtree.

**MEMPHIS**—Tennessee Garage Co.; capital, \$10,000. Incorporators: Leroy H. Friedlander, Richard W. Burk, Dan L. Killain, A. D. Bearman and Joseph Friedlander.



# Automobile Agencies Recently Established

## PASSENGER CARS

**Kansas**  
Chapman.....Oldsmobile...Perry Frazier  
Ellsworth.....Overland....C. B. Flora & Charles Hackenberger

**Massachusetts**  
Boston.....Empire.....Empire Motor Sales Co.  
Boston.....Regal.....W. L. Russell Co.  
Boston.....Saxon.....Saxon Motor Car Co.  
Pittsfield.....Chandler.....City Garage & Sales Co.  
Springfield.....Dodge.....P. A. Williams, Jr.  
Worcester.....Trumbull.....Edward E. Allen

**Michigan**  
Detroit.....Franklin.....Wm. Doughty  
Detroit.....Gadabout.....Gadabout Sales Co.  
Saginaw.....Franklin.....Fred H. Witters  
St. Johns.....Briscoe.....W. M. Luecht  
Three Rivers.....Saxon.....Three Rivers Garage

**Minnesota**  
Arlington.....Oldsmobile...H. J. Moskop  
Brainerd.....Haynes.....Sherlund Co.  
Chatham.....Oldsmobile...Co. A. Murphy  
Duluth.....Oldsmobile...E. W. Bradley  
Eagle Lake.....Haynes.....John Casper  
Kasson.....Oldsmobile...Otterness & Son  
Lake Elmo.....Oldsmobile...A. Fazendin  
Minneapolis.....Durant-Dort-La Grosse Auto Co. (Smith)  
Minneapolis.....King.....Martin Motor Sales Co.  
Minneapolis.....R-C-H.....Northwest Haynes Auto Co.  
New Germany.....Oldsmobile...New Germany Auto Co.  
Newport.....Oldsmobile...Metzger Bros.  
Olivia.....Haynes.....Knech & Jansen  
Winona.....Cole.....Nevius Livery & Transfer Co.  
Wykoff.....Haynes.....Olson & Leutink

**Mississippi**  
Columbus.....Regal.....S. L. Wright  
Duck Hills.....King.....E. E. Wilkins  
Meridian.....Haynes.....Bostick Lumber & Mfg.  
Meridian.....KisselKar.....A. J. Lyons & Co.  
Perthshire.....Chandler.....S. D. Knowlton  
Vicksburg.....Haynes.....B. J. Robinson Mach. Works.

**Missouri**  
Columbia.....Moon.....W. C. Bowling  
Hannibal.....Moon.....Long Mig. Co.  
Joplin.....Moon.....Joplin Supply Co.  
Kansas City.....King.....King Motor Co. of Miss.  
Kansas City.....Moon.....MacDowell Motor Car Co.  
Kansas City.....R-C-H.....J. A. Garnier & Son  
Mexico.....Saxon.....Fred A. Morris  
Moberly.....King.....King Motor Sales Co.  
Mound City.....Franklin.....C. N. & J. Scott  
Ravenwood.....Haynes.....E. F. Bishop  
Ridgeway.....King.....Curtis & Francis  
St. Charles.....Oldsmobile...Dr. F. J. Tainter & Dr. B. K. Strumberg  
St. Louis.....Dodge.....Frank R. Tate  
St. Louis.....Haynes.....Newell Motor Car Co.  
St. Louis.....Haynes.....St. Louis Kisselkar Co.  
St. Louis.....Chandler.....Heinrich Auto Co.  
St. Louis.....Chandler.....Lewis Auto Co.  
St. Louis.....Regal.....Anselm Ganahl Motor Car Co.

**Montana**  
Sheridan.....Haynes.....H. R. Marsh

**Nebraska**  
Coleridge.....Haynes.....Howard Morrison  
Cozad.....King.....Wm. Robertson  
Omaha.....Regal.....T. G. Northwall Co.

**New Hampshire**  
Manchester.....Maxwell.....Maxwell Motor Sales Co.

**New Jersey**  
Atlantic City.....Oldsmobile...Irwin's Garage  
Delaware.....Franklin.....Quig Brothers  
Elizabeth.....Oldsmobile...Franklin Garage  
Hackensack.....Oldsmobile...Hackensack Auto Co.  
Trenton.....King.....J. R. McCardell & Co.

**New Mexico**  
Albuquerque.....Oldsmobile...J. L. LaDriere  
Taos.....Oldsmobile...Dr. T. P. Martin

**New York**  
Auburn.....Moon.....Moon Garage  
Avon.....Oldsmobile...H. W. Spencer, care of Central Garage Co.  
Baldwin.....KisselKar.....Baldwin Garage  
Bloomington.....KisselKar.....Clapham & Hagan  
Brooklyn.....Moon.....Putnam Motor Car Co.  
Buffalo.....King.....Mutual Motor Car Co.  
Elmont.....King.....Hoefner Bros.  
Ellenville.....KisselKar.....R. D. Cookingham  
Groton.....Regal.....J. H. Waterman  
Lestershire.....King.....Chas. H. Wakeman  
Lodi.....Oldsmobile...John C. Townsend  
Marathon.....Regal.....W. E. Seamans & Son  
Mt. Vernon.....Cole.....Central Garage Co.  
New York.....KisselKar.....Benz Auto Corp.  
New York.....Lewis-Six.....Stewart Auto. Co.  
Plattsburg.....King.....L. G. Barton  
Port Jefferson.....KisselKar.....D & H Garage

Quogue.....King.....Louis Muley  
Saranac Lake.....King.....Shelley Tool Co.  
Shelter Island.....King.....Geo. B. Wells  
Skaneateles.....Oldsmobile...G. A. Chamberlain & Co.  
Suffern.....KisselKar.....Suffern Garage  
Syracuse.....King.....Ferdinand Crosby  
Syracuse.....Oldsmobile...W. R. Shaw  
Utica.....King.....Fred Klopfanstein  
Wellsville.....Franklin.....Messrs. Brown & Duke

**North Carolina**  
Charlotte.....Haynes.....Ham Ross Motor Co.

**North Dakota**  
Fargo.....Cole.....C. H. Reineke & Son  
Dickinson.....Oldsmobile...E. G. Holst  
New Salem.....King.....Schultze & Toppins

**Ohio**  
Akron.....Regal.....Main Auto & S. Co.  
Akron.....Saxon.....Prospect-Buick Co.  
Bucyrus.....Haynes.....H. A. Paxton  
Bucyrus.....Oldsmobile...McFarland, Miller & White  
Cambridge.....Overland...V. W. Fordyce  
Canton.....Chalmers.....Al Shem  
Cincinnati.....Chalmers.....Fischer Auto & Service Co.  
Cincinnati.....Herff-Brooks.....Herff-Brooks Motor Sales Co.  
Cincinnati.....King.....Avon Garage & Sales Co.  
Cincinnati.....Hupmobile...Charles Schiear Motor Car Co.  
Cleveland.....King.....Dunham Motor Co.  
Cleveland.....Moon.....Dunham Motor Car Co.  
Clyde.....Oldsmobile...W. A. Roush & Son  
Columbus.....Ford.....Ohio Auto Sales Co.  
Columbus.....Imperial...Warren-Southwick Co.  
Columbus.....King.....Auto Inn & Exchange Co.

Columbus.....Oldsmobile...Muzzy's Garage  
Columbus.....Oldsmobile...W. W. Muzzy  
Columbus.....Velic.....Winders Motor Car Co.  
Coshocton.....Haynes.....Fifth Street Garage  
Cumberland.....Overland...Young & Mann  
Dayton.....Detroit.....F. C. Moody  
Grand Rapids.....Oldsmobile...E. H. Mercer  
Greenville.....Westcott...John W. Ludy  
Hebron.....Westcott...C. A. Pence  
Lewistown.....Westcott...F. J. Wilson  
Lima.....Buick.....W. F. Bryan  
Lima.....Moon.....H. L. Sherrick  
Lima.....Overland...Lima Overland Co.  
Lorain.....Oldsmobile...F. F. Burrer  
Marietta.....Lozier.....Walter W. Wood  
Mt. Glead.....Oldsmobile...Wm. D. Mathews  
Mt. Vernon.....Oldsmobile...B. E. Salisbury  
Mt. Vernon.....Oldsmobile...B. E. Salisbury  
Nelsonville.....Oldsmobile...Frank Minner  
New Philadelphia.....Buick.....F. S. Hertzog  
Portsmouth.....Haynes.....Hill Top Auto Co.  
Powhatan Pt.....Oldsmobile...F. E. Berry  
Springfield.....Oldsmobile...Eaton Motor Service Co.  
Springfield.....Oldsmobile...Eaton Motor Service Co.  
Springfield.....Westcott...E. L. Ensien  
Steubenville.....Franklin.....Messrs. Hill & Lydick  
Steubenville.....Haynes.....Steubenville Motor Car Co.

Toledo.....Detroit.....Guy R. Ford  
Toledo.....Oakland...Guy R. Ford  
Toledo.....Regal.....Auto Distributing Co.  
Toledo.....King.....Maumee Motor Car Co.  
Toledo.....Oakland...Guy R. Ford  
Wauseon.....Oldsmobile...Miller & Hoy  
Youngstown.....King.....I. Ralph Seidner  
Youngstown.....Moon.....Regal Sales Co.  
Youngstown.....Regal.....Regal Sales Co.

**Oklahoma**  
Tulsa.....Chandler.....J. T. Forster  
Tulsa.....Oldsmobile...New State Auto & S. Co.

**Pennsylvania**  
Allentown.....Moon.....W. F. Rabenold  
Altoona.....King.....R. E. Bell  
Barnesboro.....Oldsmobile...J. H. Vogel  
Bloomsburg.....Oldsmobile...J. W. Wright  
Carlisle.....KisselKar.....Gillmor & Kaufman  
Cannonsburg.....Cole.....Globe Garage & Mach. Co.  
Doylestown.....Oldsmobile...Geo. B. McLaughlin  
Erie.....Saxon.....Motor Service Co.  
Johnstown.....Westcott...S. N. Hayes  
Lehighton.....Oldsmobile...Jones Garage Co.  
McKean.....King.....F. X. Bowman  
Mt. Union.....Haynes.....City Garage  
Monongahela.....Haynes.....Monongahela, Pa.  
New Castle.....Cadillac...Elton Auto & Repair Co.  
Norristown.....Haynes.....F. Kenneth Moore  
Philadelphia.....Dodge.....Thornton-Fuller Auto Co.  
Philadelphia.....Moon.....Stearns Motor Co.  
Philadelphia.....Regal.....Regal Sales Organization  
Pittsburgh.....King.....W. W. Bennett Motor Car Co.  
Pittsburgh.....Chandler...Vestal M. C. Co.  
Pittsburgh.....Regal.....Buhl Regal Car Co.  
Rummel.....Moon.....Rummel Auto Co.  
Scranton.....Oldsmobile...The Oldsmobile Sales Co.  
Scranton.....Oldsmobile...Oldsmobile Sales Co.  
Tyrone.....Haynes.....W. H. & J. R. Davis  
Tyrone.....KisselKar...J. Ray Davis  
Uniontown.....Saxon-Studebaker.....J. T. Binns  
Washington.....Haynes.....H. L. Robinson  
Waynesboro.....King.....Owen D. Shank  
Wilkes-Barre.....Haynes.....Frank F. Matheson

**Rhode Island**  
Providence.....Dodge.....Arthur J. Feltham

**South Carolina**  
Greenville.....Oldsmobile...W. M. Thompson  
Williamston.....Oldsmobile...Jas. P. Gossett

**South Dakota**  
Mitchell.....Oldsmobile...Mitchell Auto & Supply Co.  
Tabor.....Oldsmobile...Jos. Skorplik & Co.

**Tennessee**  
Nashville.....King.....Alexander Bennie & Co.

**Texas**  
Balmorhea.....Oldsmobile...Will J. Rhea  
Fort Worth.....Oldsmobile...Oldsmobile Sales Co.  
Galveston.....Haynes.....Texas Garage  
San Angelo.....Oldsmobile...Cain Bros.  
San Antonio.....King.....Guarantee Motor Car Co.  
Wichita Falls.....King.....Shamburger

**Utah**  
Salt Lake City.....Chandler...Frank Roueche

**Virginia**  
Norfolk.....Moon.....Norfolk Garage & Mach. Shop  
Pulaski.....Haynes.....City Auto Corporation

**Vermont**  
Beebe Plains.....KisselKar...J. E. Turner

**Washington**  
Everett.....Dodge.....F. C. Sheridan & C. E. Dow  
Seattle.....King.....F. H. Bardshar

**West Virginia**  
Bluefield.....Chandler...Jno. L. Crockett  
Davis.....Oldsmobile...L. E. Crain  
Logan.....Chandler...J. A. Washington  
Wheeling.....Haynes.....Everybody's Garage

**Wisconsin**  
Eau Claire.....Cole.....Tamberg Auto Co.  
Johnson Creek.....Buick.....J. C. Shekey Co.  
Lancaster.....KisselKar...John Day  
Lone Rock.....KisselKar...B. M. Dewey  
Manitowoc.....Briscoe...Olson-Paully Motor Co.  
Manitowoc.....Ford.....Dicks Motor Car Co.  
Manitowoc.....Oldsmobile...Chas. A. Streich  
Marshfield.....KisselKar...Hugo Wegener  
Milwaukee.....Apperson...Creek Motor Sales Co.  
Milwaukee.....Briscoe...Milwaukee Auto Sales Co.  
Milwaukee.....Chandler...Schreiber-Boorse Motor Car Co.  
Milwaukee.....Dodge.....Edwards Motor Car Co.  
Milwaukee.....King.....Schreiber-Boorse Motor Car Co.  
Milwaukee.....Locomobile...Harry F. Krueger  
Milwaukee.....Maxwell...Johnson Auto Co.  
Milwaukee.....Oldsmobile...Emil Estberg  
Milwaukee.....R-C-H...Creek Motor Sales Co.  
Waukesha.....KisselKar...R. W. Crary

**Wyoming**  
Cody.....Haynes.....Adam Hogg  
Douglas.....Moon.....Rice Hdwe. & Motor Co.

## COMMERCIAL CARS

**Maryland**  
Hagerstown.....Koehler...Central Garage & Elec. Co.  
Maryland Line.....Koehler...H. Curtis Krout

**North Carolina**  
Durham.....Koehler...Carpenter Bros.  
Raleigh.....Koehler...Ford Sales Co.  
Winston-Salem.....Koehler...The Motor Co.

**New York**  
Brockport.....Koehler...Frank E. Wilson

**Ohio**  
Cook.....Koehler...H. M. Campbell

**Pennsylvania**  
Easton.....Koehler...James S. Lerch

**Tennessee**  
Dyersburg.....Koehler...Dyersburg Auto Co.

**Texas**  
Houston.....Koehler...Young & Dwire

## ELECTRIC VEHICLES

Washington.....Waverley Electric...Pollock Car Corp.  
Minneapolis.....Flanders Electric...Henry C. Burleigh

# Automobile Agencies Recently Established

## PASSENGER CARS

**Alabama**  
Birmingham.....King.....Core Motor Sales Co.  
Birmingham.....Moon.....Chafin Auto Co.

**Arkansas**  
Little Rock.....King.....Shoemaker Bale Auto Co

**California**  
Eureka.....Haynes.....Mercer & Way Garage  
Hanford.....Oldsmobile.....Marak & Haynes  
Long Beach.....Kieselkar.....Mission Garage  
Los Angeles.....Glide.....Battley Bros.  
Los Angeles.....Herfi-Brooks.....De-Vaux Motor Sales Co.  
Los Angeles.....Moop.....L. C. Baxton  
Los Angeles.....Saxon.....Hawley, King & Co.  
Los Angeles.....Saxon.....Holley King Co.  
Maysville.....Haynes.....Merles Garage  
Oakland.....Oakland.....F. H. Dailey Motor Car Co.

Porterville.....Oldsmobile.....The Mission Garage  
Sacramento.....Chalmers.....J. S. Vasey  
Sacramento.....Oldsmobile.....Bend & Duren  
San Bernardino.....Oldsmobile.....Central Garage  
San Francisco.....Glide.....The Continental Auto Co.  
San Francisco.....King.....Reliance Auto Co.  
San Francisco.....Oakland.....F. H. Dailey Motor Car Co.  
Santa Maria.....Oldsmobile.....W. H. Crakes  
Santa Monica.....Oldsmobile.....R. C. Silvernale  
Ukiah.....Haynes.....Gowan Bros.  
Weed.....Oldsmobile.....Weed Mercantile Co.

**Canada**  
Calgary.....Haynes.....H. T. Sheffield  
Calgary, Alta.....King.....Diamond Motor Car Co., Ltd.

Calgary, Alta.....Maxwell.....Thos. E. Jackson  
Lethbridge, Alta.....King.....H. B. Henderson Garage  
Victoria, B. C.....Lozier.....J. Cameron  
Hamilton.....Oldsmobile.....Hamilton Garage Co.  
Winnipeg, Man.....Malcolm.....I. H. Weeks  
Winnipeg, Man.....Van Auker.....Manitoba Elec. Motor Car Co.  
Halifax, N. S.....King.....L. M. Trask Co.  
Berlin, Ont.....Regal.....E. L. C. Brown  
Hamilton, Ont.....Cole.....Patterson Auto Sales Co.  
Hamilton, Ont.....Haynes.....Jack V. Elliott  
London, Ont.....Chandler.....Central Garage  
Niagara Falls, Ont.....Marathon.....Crane Bros.  
Ottawa, Ont.....Brockville.....Atlas.....Hull & Ottawa  
Paris, Ont.....Saxon.....A. C. Lee  
Sault Ste. Marie, Ont.....Regal.....G. P. Black  
Toronto, Ont.....Kissell.....H. E. Rickettson

Swift Current, Sask. King.....Wright & Mitchel (McDougall)  
Lepage, Que.....Moon.....Lepage Garage & Exchange Co.  
Montreal, Que.....Moon.....Sovigny & Lalonde  
Moose Jaw, Sask.....Maxwell.....Henry B. Annabel  
Toronto, Ont.....Regal.....Regal Motor Sales Co.  
Canon City.....Moon.....J. J. Armstrong & Son

**Colorado**  
Colorado Springs.....Moon.....C. S. Wolfe  
Denver.....Briscoe.....Cadillac Motor Co.  
Denver.....Crescent.....George E. Hannan  
Denver.....Henderson.....Mid-West Auto Sales Co.  
Denver.....Hupmobile.....George A. Estabrook  
Denver.....Moon.....Vreeland Bros. Auto Co.  
Denver.....Regal.....Mid-West Auto Sales Co.  
Denver.....Saxon.....Colorado Motor Car Co.  
Trinidad.....Franklin.....W. G. Hall

**Connecticut**  
Bridgeport.....Cole.....West End Auto & Carriage Co.  
New Haven.....Moon.....Reichert Auto. Co.  
New Haven.....Stearns.....Holcomb Co.  
Waterbury.....Moon.....Wm. F. McGinniss  
Wethersfield.....Moon.....Kingsbury & Wetherell  
Winsted.....Haynes.....John & Nelson Secor

**Cuba**  
Havana.....Cole.....A. L. Fernanders Morre

**Washington, D. C.**  
Washington.....King.....Wm. P. Barnhart  
Washington.....Mitchell.....Crescent Motor Co.  
Washington.....Stutz.....Tighman & Owen

**Georgia**  
Atlanta.....King.....W. F. Plane, Jr.  
Atlanta.....Regal.....Harry Holland & Henry Collier  
Valdosta.....Haynes.....Jno. T. Roberts & Son

**Idaho**  
Burley.....Haynes.....Dr. Carl Snodgrass

**Illinois**  
Adrian.....Glide.....J. L. Atwater  
Aurelia.....King.....Julius Jordan  
Barry.....Haynes.....McVay & Lake  
Chatsworth.....Haynes.....T. E. Baldwin  
Chicago.....Haynes.....Julius Debits  
Chicago.....King.....W. E. Stalnaker  
Chicago.....Oldsmobile.....De Luxe Auto Service Co.

Chicago.....Oldsmobile.....John Hemwall Auto Co.  
Chicago.....R-C-H.....Gus B. Owens & J. H. Quinlan  
Columbia.....Moon.....L. P. Weinel  
Du Quoin.....Moon.....Our Garage  
East St. Louis.....Haynes.....East Side Overland Auto Co.

Granville.....Haynes.....Excelsior Garage Co.  
Henning.....Haynes.....T. T. Cornell  
Jerseyville.....Moon.....O. S. Nelson  
Kewanee.....Maxwell.....E. J. Mosier  
LaSalle.....Oldsmobile.....Leonard Travis, Cadillac Garage  
Lincoln.....Oldsmobile.....Frank R. Woland  
Manhattan.....Oldsmobile.....Manhattan Motor Car Co.

Marion.....Oldsmobile.....Hosea W. Cagle  
Olney.....King.....A. E. Hill  
Ottawa.....Oldsmobile.....F. S. Knowles, care of W. H. Knowles Foundry & Machine Co.

Piper City.....Glide.....W. L. Quick  
Ridgefarm.....Haynes.....D. A. Jones  
Rushville.....Haynes.....A. C. Tomlinson  
Springfield.....Moon.....Engle & Otto  
Springfield.....Oldsmobile.....L. Lee Savage  
Spring Valley.....Cole.....Miller & Co.  
St. Augustin.....Moon.....Sherman Babbitt  
Tuscola.....Haynes.....Douglas County Auto Co.

**Indiana**  
Butler.....Haynes.....J. C. Brown & Son  
Converse.....Haynes.....Wm. A. McDaniel  
Frankfort.....Cole.....Model Machine Works  
Frankfort.....Haynes.....W. F. Kernedle  
Fowler.....Haynes.....The Sleeper Co.  
Gary.....Haynes.....Doeman & Sykes  
Highland.....Oldsmobile.....Highland Garage  
Indianapolis.....Haynes.....Indianapolis Haynes M. C. Co.  
Indianapolis.....King.....W. J. Fitton  
LaFayette.....Haynes.....J. L. Sheetz  
Lawrenceburg.....Haynes.....Lawrenceburg Garage & Repair Co.

Logansport.....Haynes.....B. F. Conwell  
Milford.....Haynes.....F. M. Neff  
Muncie.....Haynes.....A. E. Needham  
South Bend.....Haynes.....J. W. Nikart  
Tipton.....Haynes.....K-C Motor Co.  
Warsaw.....Haynes.....Earl W. Cenrad

**Iowa**  
Alta Vista.....Oldsmobile.....Alta Vista Auto Co.  
Cedar Rapids.....Moon.....Moon Auto Sales Co.  
Center Point.....Haynes.....Heverly & Knight

# Recent Incorporations in the Automobile Field

**Arkansas**  
LITTLE ROCK—Butler Auto Co.; capital, \$12,000; motor cars. Incorporators: F. L. Butler, Fremont Stokes and Mary A. Stokes.

**Canada**  
LONDON, ONT.—Warwick Wheel Co. of Canada; capital, \$100,000; to manufacture and deal in vehicle wheels, springs, tires, rims, etc.  
TORONTO, ONT.—Noble Air Pump Co.; capital, \$25,000; to manufacture motor car pumps and accessories.

**Colorado**  
PUEBLO—Silver State Auto Co.; capital, \$50,000.

**Delaware**  
NEW CASTLE—New Castle Garage; capital, \$25,000. Incorporators: S. C. Mulrooney, E. Krause and J. W. Brady, all of Wilmington.  
WILMINGTON—Sharp & Rush Bros. Co.; capital, \$75,000; to manufacture motor cars, wagons, etc. Incorporators: F. R. Hansell, Philadelphia, Pa.; G. H. B. Martin and S. C. Seymour, both of Camden, N. J.

**Georgia**  
SAVANNAH—Dupon Auto Livery Co.; capital, \$1,000; motor cars. Incorporators: R. A. Hicks and F. T. Dupon. (Central Press Bu.)

**Illinois**  
CHICAGO—Automobile Clearing House; capital, \$1,000; to manufacture, repair and deal in motor car repairs and accessories. Incorporators: R. E. Gray, C. E. Hall and J. C. Morrow.  
CHICAGO—Century Auto Top & Supply Co.; capital, \$10,000; to manufacture and deal in motor car supplies. Incorporators: B. M. Goff, C. A. Wever and B. M. Goff.  
CHICAGO—Flanders Electric Co.; capital, \$25,000; to manufacture electrical appliances. Incorporators: J. P. O'Shaughnessy, J. P. Rosen and J. L. Toohy, all of Chicago.  
CHICAGO—Gas-O-Co.; capital, \$20,000; to buy, sell and deal in gasoline, kerosene, electricity and all other commodities for motive power. Incorporators: Herbert K. Greenman, Arthur W. Brinell and Jacob A. Prassel.  
CHICAGO—Lyon Tire & Rubber Co.; capital, \$10,000; to manufacture and deal in tires. Incorporators: Leroy Harris, A. W. Lemke and W. B. Lathrop.  
OAK PARK—Harrigan Auto Co.; capital, \$5,000; to manufacture, lease, repair and deal in motor cars and other conveyances. Incorporators: George Von Moos, Agnes Von Moos and Thomas J. Harringer.

**Indiana**  
INDIANAPOLIS—Hartman Top Co.; capital, \$5,000; motor car and vehicle tops. Incorporators: Lawrence C. R. H. and L. M. Hartman.  
SOUTH BEND—Teschner Tire & Equipment Co.; capital, \$1,000; to deal in motor car accessories. Incorporators: Frank A. Teschner, Z. P. Teschner and Charles F. Roth.

**Kentucky**  
HENDERSON—White-King Motor Co.; capital, \$2,500; to deal in motor cars. Incorporators: Larkin White, Herbert L. King and Ben T. White.  
LOUISVILLE—Orolo Mfg. Co.; capital, \$10,000; general motor vehicle business. Incorporators: William H. Roose and others.  
LOUISVILLE—Overland-Louisville Co.; capital, \$10,000; to deal in motor cars. Incorporators: James H. Limbird, Robert H. Green and Charles S. Lattin.  
SOMERSET—G. & O. Taxi-Service Co.; capital, \$1,200. Incorporators: F. E. Gregory, W. H. Girdler and others.

**Massachusetts**  
BOSTON—Apex Carburetor Co.; capital, \$75,000; to manufacture carburetors. Incorporators: G. E. Parker and K. F. Parker, both of Boston, and others.  
BOSTON—Johnson Pneum-Tire Co.; capital, \$1,000,000. Incorporators: William P. Meehan and others.

**Michigan**  
DETROIT—Automobile Owners Protective Association; capital, \$10,000. Incorporators: Isaac Applebaum, Mark Mitchell and Louis Applebaum.  
DETROIT—Berry Automobile Pump Co.; capital, \$10,000. Incorporators: Charles Retter, William W. Gunn and Henry J. Berry.  
DETROIT—Cincinnati Precision Lathe Co.; capital, \$12,500; to manufacture lathes and special machinery and tools. Incorporators: Albert M. Farner, G. McHenry and others.  
DETROIT—Disco Electric Starter Co.; capital, \$60,000. Incorporators: Jacob and Henry J. Dornbus, Charles J. Carpenter.  
DETROIT—National Electric Starter Co.; capital, \$10,000. Incorporators: Trevor S. Murton, Harold K. Murton and Frederick M. Guy.  
DETROIT—Wagner Resilient Wheel & Tire Co.; capital, \$500,000. Incorporators: William F. Wagner, William F. Ferguson, G. H. Karicofe, W. E. Russell and A. C. Baird.  
JACKSON—Jackson Cover & Bag Co.; capital, \$12,000; to manufacture motor car covers of paper and cloth.

SAGINAW—Letts Auto & Taxicab Co.; capital, \$12,000; motor cars and supplies. Incorporators: F. L. Butler and others.  
TRAVERS CITY—West Michigan Garage; capital, \$6,000. Incorporators: James B. Martin, William P. Crotsier, R. E. Wynkoop and James Purvis.

**Missouri**  
LAWRENCEVILLE—Automatic Eagon Brake Co.; capital, \$10,000. Incorporators: Olin E. Gillett, William S. Titus and Alvin E. Hill.  
ST. LOUIS—Gerdelman Auto Supply Co.; capital, \$10,000; general motor vehicle business. Incorporators: Benjamin Gerdelman, Rudolph L. Gerdelman and Lotta Gerdelman.  
ST. LOUIS—Kochler-Woodruff Auto Repair Co.; capital, \$2,000; general motor car and repair business. Incorporators: Frank J. Koehler, Leath Woodruff and Henry J. Kroeger.

**North Carolina**  
SALISBURY—Piedmont Automobile & Truck Co.; capital, \$25,000; to deal in motor cars, etc. Incorporators: W. A. Brown and others.

**New Jersey**  
TRENTON—B. & K. Specialty Mfg. Co.; capital, \$50,000; to manufacture rubber goods, hardware, electrical appliances, etc. Incorporators: L. W. King, S. Berman and U. G. King, all of Trenton.  
WESTWOOD—Bergen Machine & Auto Repair Co.; capital, \$30,000; general motor car and machine shop business. Incorporators: J. B. Haskin, New York, N. Y.; P. S. Schultz, Westwood, N. J.

**New York**  
BROOKLYN—Sterling Auto Exchange; capital, \$10,000. Incorporators: Charles Erickson and William C. Lohse, both of 622 Pacific street; Henry Moler, Farmingdale, L. I.  
BROOKLYN—Universal Tractor Co.; capital, \$15,000. Incorporators: Florence O'Sullivan, 120 A Rockaway avenue; Charles Roessle, 907 New York avenue; Joseph Woodcock, 181 West street.  
HEMPSTEAD—Topford Detachable Limousine Co.; capital, \$50,000; to manufacture motor car bodies, etc. Incorporators: John A. McAvoy and William Hutchinson, both of Hempstead; Frank C. Cadden, 200 Fifth avenue, New York, N. Y.  
NEW YORK—Boska Mfg. Co.; capital, \$100,000; to manufacture rubber tires and tire fillers. Incorporators: Charles F. Saunders, 164 Sherman avenue; R. W. Wason, 607 W. 139th street; Simon F. Peavey, Jr., 151 Columbia Heights, Brooklyn.



# Accessories for the Automobilist

**NEW Champion Priming Plug—**The Champion Spark Plug Co., Toledo, O., has brought out a new type of priming plug, Fig. 1, especially adapted for winter use.

It is similar to the former priming plug of Champion make so far as the combination of a priming cup with a plug is concerned, but it has the new features of a handle for turning the needle valve so as to admit the gasoline to the cylinder, and also a new steel needle valve, hardened and ground to a compression-tight seat in the priming portion of the shell.

There is an opening in the top of the needle valve for insertion of the oil-can nozzle. Having filled the priming cup, which is the inner part of the needle valve itself, the valve is raised from its seat by turning the handle. This allows the gasoline to flow through the side of the valve and down through its own channel to the plug base. Thus vaporization occurs directly past the ignition points, insuring ignition at once. The price is \$1.25.

**Advance Ford Pump—**A power tire pump driven through the fan has been brought out by the Advance Machinery Co., Toledo, O., for Ford cars exclusively. It lists at \$6.50. It is a double-acting type, Fig. 2, with a compression space at either end of the piston, which is driven by a yoked connecting-rod.

The fan shaft or journal stud is replaced by a shaft that rotates in the pump frame. The fan is rigidly secured to this shaft, on the opposite end of which is secured a driving pinion. This driving pinion engages with a steel gear supported by an eccentric bearing, thereby providing a means whereby the pump may be engaged or disengaged with the driving pinion.

The piston is packed with three piston rings at each end. These rings preclude any possibility of oil reaching the tire tubes.

The cylinder heads are removable. They are machined so that the clearance space between the cylinder head and the piston does not exceed the thirty-second of an inch.

The discharge valves are located at the end of the piston stroke. They are quarter-inch steel balls retained by light springs.

The cylinder is lubricated by means of wicks located in the middle of the body. The wicks are saturated with oil. All other bearings are oiled direct.

**Easyon Tire Chains—**The device shown in Fig. 3 has just been put on the market by the Leather Tire Goods Co., Niagara Falls, N. Y., to prevent skidding and give traction when the wheels tend to slip. Eight of these go to make up a set and they are attached to the spokes of the wheels. The part of the chain coming into contact with the wood of

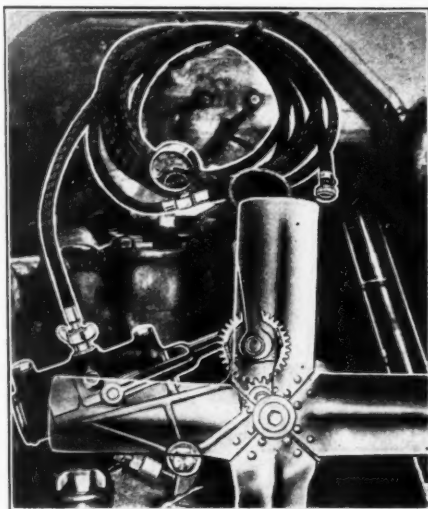


Fig. 2—Advance Ford pump driven by fan



Fig. 3—Easyon tire chains

the wheel is made of leather, while the portion touching the tire tread is rounded so that it will not cut the tire. Four chains are used on each rear wheel. These chains are made in two sizes, the small size fitting 2, 3.5 and 4-inch tires, and the larger size fitting 4, 4.5 and 5-inch tires.

**Dudly Folding Shovel—**An all-steel

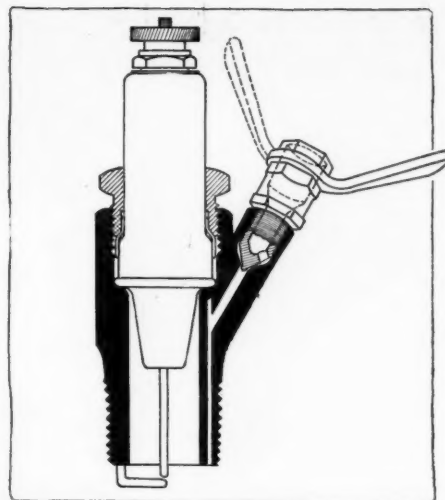


Fig. 1—New Champion priming plug

shovel, Fig. 4, of the folding type, with a blade 6.5 by 9 inches and a 3-foot handle, has been brought out by the Dudly Tool Co., Menominee, Mich.

It makes it possible for the tourist to dig himself out quickly when stalled in the mud. In addition the blade of the shovel may be used to place the jack on when the ground is soft.

The weight of the shovel is 4 pounds, and it occupies a space 12 by 6.5 by 2 inches when folded up. It is nickel-plated and sells for \$3.

**J-M Tirenew and Narco Filler—**J-M Tirenew is a compound of Para rubber in liquid form for use as a coating for tires. While adding to the appearance of the tires by making them clean and fresh-looking the makers insist that this is by no means its chief value. It is claimed that this compound penetrates into the cuts and crevices and thoroughly waterproofs the exposed fabric beneath, thus preventing decay from moisture and oil, and greatly prolonging the life of the tire.

For use in connection with the above, the makers recommend J-M Narco Tire Cut Filler, a combination cement cut filler and mastic, heavy in rubber. This substance fills the cuts and holes in a tire, welds the loosened tread to the casing and, it is claimed, forms a union so perfect as to be immune to the effects of road abuse. It sets over night and is said to be absolutely non-shrinking.

To restore and preserve automobile tops there is a special Narco product called J-M Narco Rubber Reviver and Refinisher. It is not a varnish, but a liquid rubber compound with an absolutely invisible protecting coat that waterproofs pantasote, mohair, fabric or rubber, with equally good results. One coat, it is asserted, lasts a long time.

In addition to the foregoing, the J-M Narco line also includes patching and vulcanizing cements of the highest

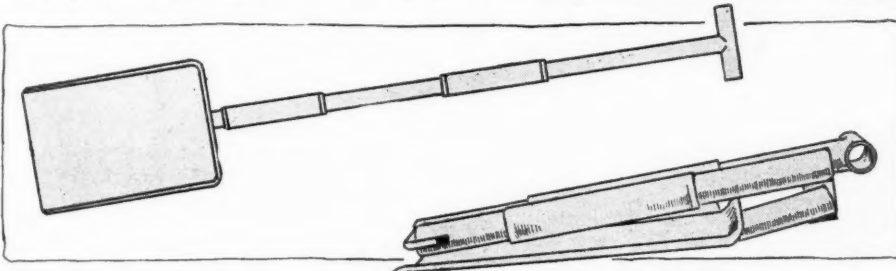


Fig. 4—Dudly folding shovel

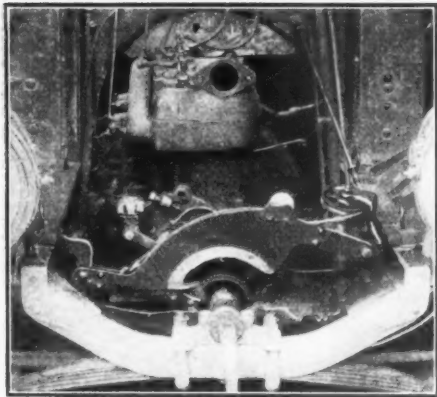


Fig. 5—Denver Ford starter

grade and special cementless patches that may be used successfully without cement or acid. For the convenience of car owners who operate a small vulcanizer, four vulcanizing outfits are regularly supplied each containing enough for several jobs. Another very handy outfit for making inexpensive and satisfactory home and roadside repairs is the J-M Narco Ford Tire Repair Outfit, which contains a repair for every tire trouble that might possibly be met on the road, also several preventatives. This compact outfit can be carried in the tool kit and in time of need is a friend indeed.

The products are marketed by the H. W. Johns-Manville Co., 41st street and Madison avenue, New York City.

**Denver Ford Starter**—A mechanical starter, Fig. 5, of the pull type, weighing only 10 pounds, and fitting readily between the fan belt and the fan, is made by the Denver Ford Starter Co. A pull on the hand lever always connects immediately with the crank shaft, no matter where the engine happens to rest, and a 12-inch pull turns the engine over completely and quickly.

The device is entirely concealed and is bolted to the frame with two forward fender bolts. One distinctive feature is that it is not necessary to remove the crank or any part of the car to install the starter. A new fan belt pulley with a wider rim than the regular pulley, however, is furnished. The power is applied directly to the crank shaft without ratchets or cogs, two jaws gripping the rim of the fly-wheel the moment the lever is pulled. The method of connection is on the principle of slipping the jaws of a monkey-wrench over the rim of a fly-wheel and making the open wrench grip the rim by a pull downward. This method, made secure by a short, sharp jaw on the outer side of the rim, does away with slipping and allows scarcely any friction.

In case of back fire, the hand lever is automatically released by a rest on which it is seated.

This starter is adapted to both Ford and Metz cars. It sells for \$15.

**Garford Ford Speedometer**—At \$12.50 the Garford Mfg. Co., Elyria, O., is offering a speedometer for Ford cars which has a 100-mile trip odometer and a season mileage register of 100,000. The principle involves the centrifugal movement of steel balls which raise a cup in direct proportion to the speed of the flexible shaft. The construction employs a revolving drum or ball race mounted directly on the main driving shaft. This ball race has radial openings or channels

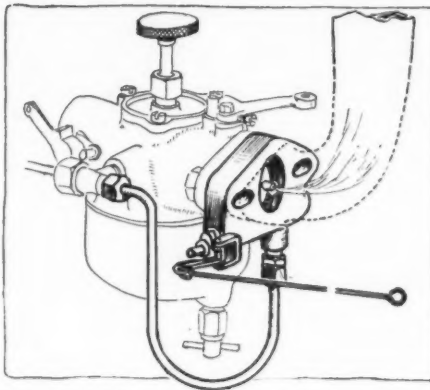


Fig. 6—Injex applied to Holley carburetor

containing four  $\frac{1}{2}$ -inch steel balls. Fitting over this ball race and arranged to move vertically in line with the main shaft is an inverted cup-shaped member of steel with the inner surface so de-

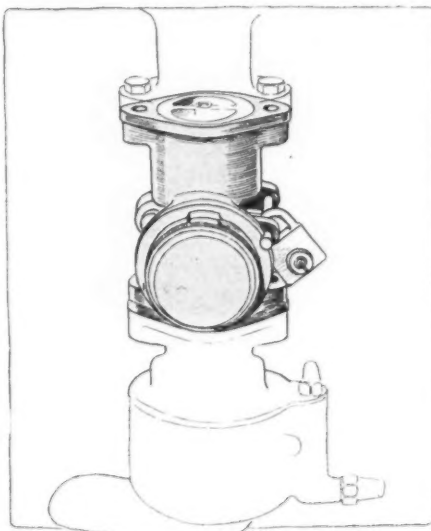


Fig. 8—Kramer self-contained engine governor, which is placed between the carburetor and the intake pipe

signed that the centrifugal movement of the steel balls in these radial grooves will raise the cup in direct proportion to the speed of the shaft. This vertical motion of the cup is transmitted to the indicating hand through a very simple lever

arm. There is one spring used in the entire system and it is used to bring the indicating parts back to zero.

**Injex Primer**—To allow easy starting of the motor in cold weather the Reflex Ignition Co., 211 High avenue, Cleveland, O., has brought out the primer shown in Fig. 6 for \$2.50.

By pulling a ring on the steering post or dash a spray of gasoline is injected from the feed pipe into the manifold.

The fuel is brought to the primer from the main gas line through a T pipe connection. Then by pulling the lever shown, a charge of gasoline is carried into the cylinder of the primer. On releasing the lever a strong spring forces the piston back and the gasoline is injected into the manifold.

Two types are made—one with a flange which is attached between the manifold opening and the carburetor, and the manifold type, which may be attached to any point of the manifold.

**Kramer Governor**—Controlling the speed of the motor by utilizing the velocity of the incoming gases is the feature of a new governor made by the Kramer Governor Co., Detroit, Mich. As is shown in Fig. 9, as the speed of the motor grows higher, the increasing velocity of the gases past the floating disk in the intake passage raises this disk and closes the damper, placed below it. Thus when the speed of the gases reaches a pre-determined amount the butterfly begins to close and the speed drops. These two members are contained in a suitable casing which is inserted between the carburetor and intake manifold. Since it is compact and self-contained, it may be easily attached to any motor. There are no revolving parts and little to get out of order or wear.

It is stated that all governors are thoroughly tested and set for a maximum speed of about 1,000 revolutions per minute. The governor may be simply adjusted to any speed desired. This gives a direct control of the piston speed of the motor as the speed of the intake gases is a direct function of the piston speed. This is of course within the limits of ordinary running where the volumetric efficiency of the motor does not vary sufficiently to alter the proportions to an appreciable extent.

Imported ball bearings are used on the shaft of the butterfly valve and a clock spring regulates its action. The throttle shaft is ground true to 1-1000 inch. Hardened steel bushings are used in the links.

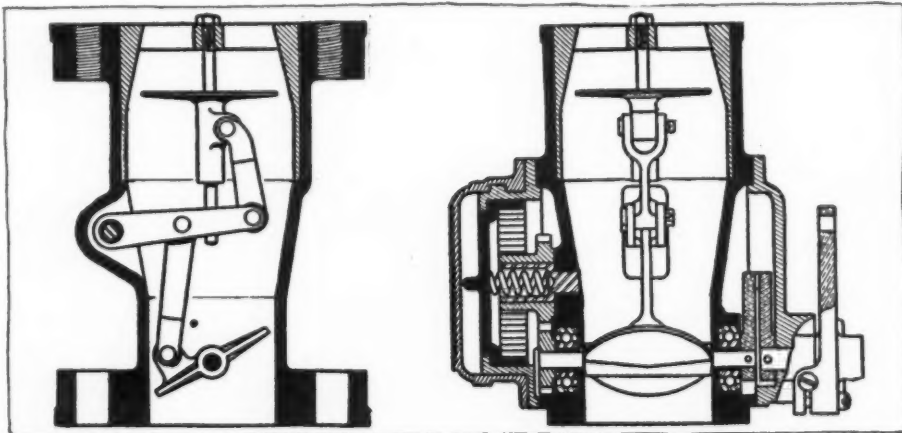


Fig. 9—Sections through Kramer engine governor showing operating disk which is raised or lowered according to the speed of the incoming gases, thus opening or closing the butterfly valve below